

THE WAR ON PRIVACY

Popular Mechanics

ANATOMY
OF A
TOP-FUEL
DRAGSTER

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FEBRUARY 2011



SCIENCE OUTDOORS TECHNOLOGY AUTOMOTIVE HOME

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GADGETS

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CELLPHONE TRACKERS
WI-FI PIRATES
CYBER STALKERS

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NOW!**

20 DIY GOOFS

Learn from
Our Mistakes

TEST: Big,
Bad Hammer
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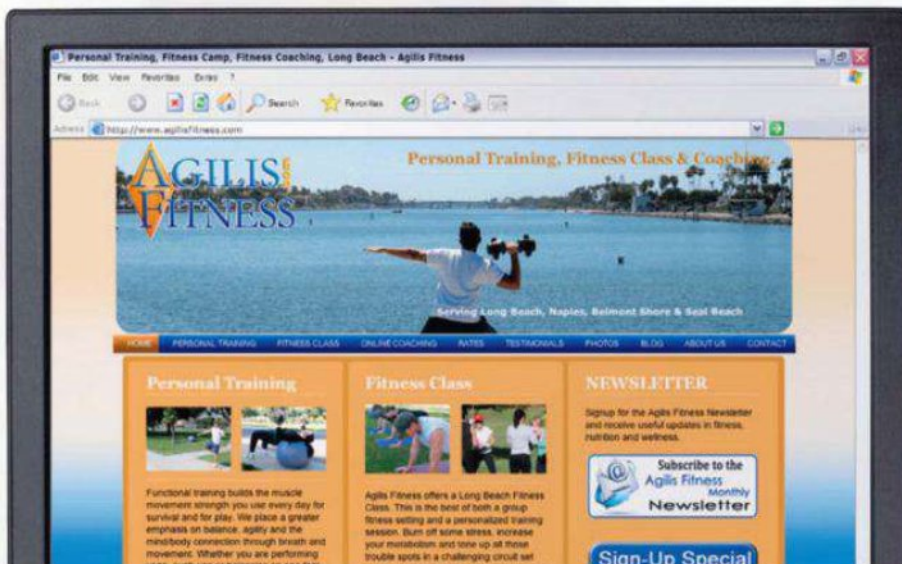
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PM FEATURES ///
VOL. 188 NO. 2

54 Surviving the Digital Swarm

Cellphones are invading your privacy, marketers sell your personal data, and cyberstalkers can empty your bank account with a few clicks. PM explores these and other digital threats—and how to fight back.

BY GLENN DERENE
AND SETH PORGES

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Nail-gun mishaps, crushed fingers, flaming engines, runaway floor sanders, rampaging power washers—you name it, we've dealt with it. Here, we share our sage advice so you can avoid these common mistakes.

BY THE EDITORS

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The automobile is morphing into a sophisticated mobile gadget. PM explores the trend and tests six state-of-the-art communication, navigation and entertainment systems.

BY G. E.
ANDERSON

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The Resurrection of XZ439

In a \$1 million adventure that nearly costs him his life, a former U.S. Marine Corps test pilot recruits a team of volunteer mechanics to renovate and fly the first civilian-owned Harrier jump jet.

BY MICHAEL
KAPLAN

Staff Sgt. Bryant Halford, a U.S. Marine Corps aviation mechanic, works on the vertical tail assembly of Harrier XZ439.

ON THE
COVER

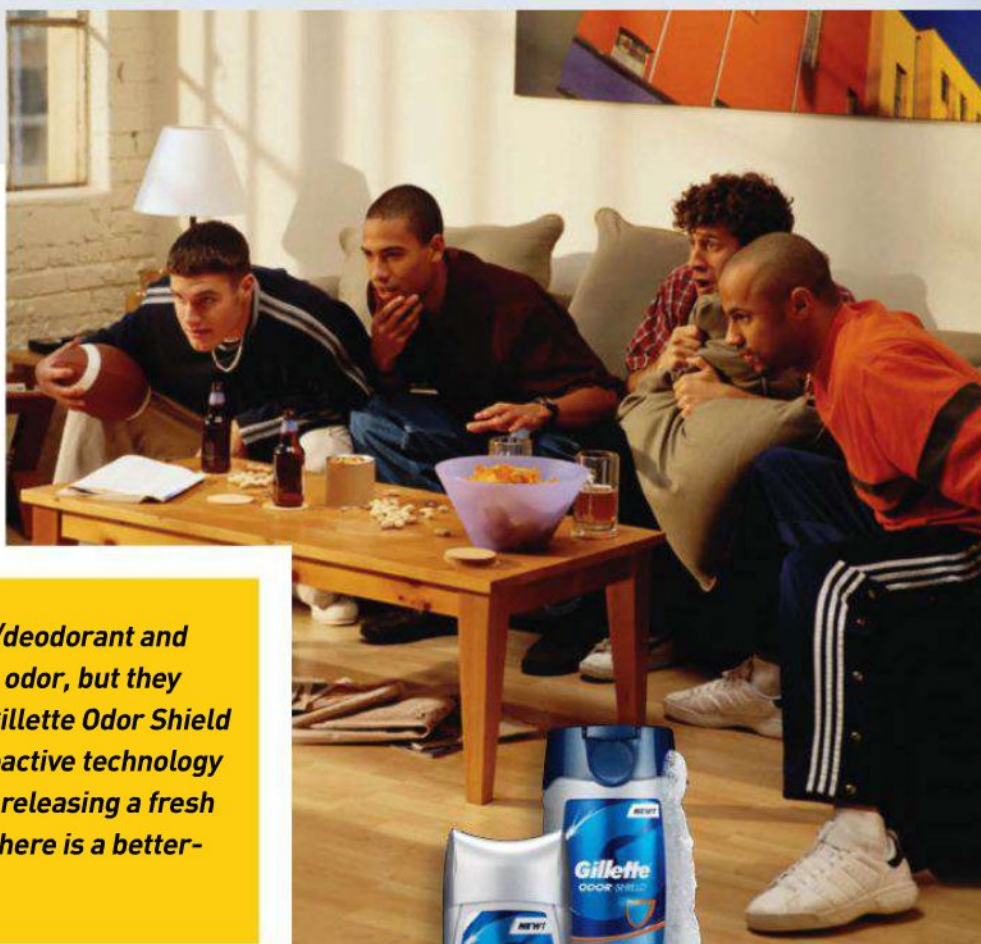
Are digital devices intruding upon your privacy? In a word, yes. Photograph taken by Phillip Toledano in November 2010 in New York City. Prop styling by Shawn Patrick Anderson, styling by Nellie Fleischer, grooming by Patricia Iglesias.

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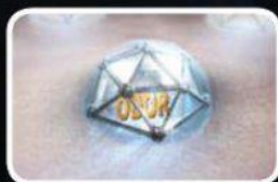
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pm do-it-yourself

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Dear Subaru,



"I got my first Subaru when I was four years old. It was a go-kart that I won in a contest. Years later, I'm the proud owner of two Outbacks and looking to add another! I still wish I had that BRAT, though!" - Reid J. Rockford, IL. **Love. It's what makes a Subaru, a Subaru.**



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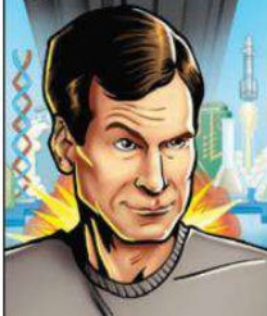
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THE (QUIET) DIESEL TAKEOVER The popularity of the VW Jetta TDI and similar cars shows that Americans are down with diesels, and not just in trucks. For diesel news—from the latest BlueTec engines to Mazda's diesel CX-7 to the diesel race cars winning at Le Mans—PM has you covered.
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WHAT'S NEXT? Vehicles have started to park themselves, take over the wheel when necessary and use key fobs that incorporate GPS tracking. We help explain breaking auto tech.
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PM Breakthrough Awards Update



CATCHING UP WITH
Alex Kipman
XBOX

In 2009, PM presented a Breakthrough Award to a team of Microsoft Xbox engineers for their game-changing user interface, Project Natal. Used at our awards ceremony that year, it rocked the house. Natal was recently released as the Xbox add-on Kinect. We talked to Alex Kipman, Xbox's director of incubation, about the revolutionary system, which responds to a player's voice and movements, doing away with conventional controllers.

PM: You've said that Kinect can detect a player's emotions. How is that possible?

AK: We're working to shift the discourse from a world where we have to understand technology to a world where technology understands us. Kinect perceives the world just as human eyes see and human ears hear. Consider *Kinectimals*, an island adventure game where you essentially discover and adopt a tiger cub. If I use my voice to name the cub, it recognizes me. If I'm happy, it's happy. If I'm sad, it's sad.

Remember the *Peanuts* specials on TV? All you could hear the parents say was "wah, wah, wah, wah," but you knew if they were mad or if they were happy. For Kinect, we've created the equivalent of an empathy engine, and, based on your voice and the positioning of your body, we guess your emotion in a way that seems like magic. We're only beginning to tap into the emotional experiences we can create with this technology.

For the complete interview, visit popularmechanics.com/kinectinterview.



PM LETTERS

would be biting the hand that feeds them.

CHARLES REVELIOTTY
CHERRY HILL, NJ

Handled With Care?

Your article on package abuse ("The Shipping News") was great, but I wish you had mentioned what is probably the most commonly shipped venomous creature: the honeybee. Every spring, beekeepers ship bees by the thousands via mail. I would be interested to know how gently those packages are handled.

GENE TIMPSON
ARNOLDSVILLE, GA

I was totally shocked at the outcome of your shipping article. I utilize all three of the featured shippers on a weekly basis, and, in my experience, USPS is consistently the laggard when it comes to delivering packages in respectable condition, with FedEx next by a long shot and UPS by far the most competent shipper of the three.

DOUG MILLER
DALLASTOWN, PA

CLARIFICATIONS: In "China's Deadliest Game" (Dec. '10), we should have stated that the U.S. fields 11 large, nuclear-powered aircraft carriers like the USS Nimitz. The "Home Ice" rink-construction photos on pages 97 and 98 of the same issue were taken by Charlene Plagens. We should have been clear in December's "Auto Excellence Awards 2011" that the Ford Mustang is available with a V6 only on the base models, not the GT.

If China Attacks

Your December article "China's Deadliest Game," mapping out a scenario in which China invades Taiwan, gives an interesting insight into high-level U.S. military thinking. However, if China were to attack Taiwan—which I consider a real possibility—the response would likely be staged out of bases in multiple nations friendly to the U.S., such as South Korea, Japan and Australia, and not from just two bases, as author Erik Sofge suggests. In any case, I applaud the magazine for shedding light on a matter of great national interest.

**LT. COL. SID HOWARD
(RET.), U.S. AIR FORCE**
MIDWEST CITY, OK

I have to ask: Why would China engage in a battle with Taiwan and the U.S.? We are China's largest export market, and it holds about a trillion dollars of our debt. If it were to take action against Taiwan, the U.S. would stop interest

Dec.

ISSUE
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✕
Readers respond to our stories on China's possible future attack on Taiwan and package handling.

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payments and seize all Chinese merchandise and assets in our country. We would cut off all trade with China, convince our allies to do the same and establish a blockade to shut down its imports. The effect on China's economy would be disastrous. By going to war with a nation the U.S. supports, the Chinese

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do you
think?

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Tech Watch

WEARABLE ROBOTICS

Unleashing Power Suits

Researchers at Raytheon continue to inch toward the Army's goal of creating robotic exoskeletons that could enhance the strength and endurance of soldiers. The XOS 2, like an earlier prototype, allows its wearer to lift 200 pounds several hundred times without tiring and to "punch through 3 inches of wood." The newest version of the hydraulically powered suit (shown at left) is lighter and faster and uses 50 percent less power than the earlier version. That's a key metric, because the researchers currently have to plug in the suit to operate it; a nontethered suit will require further power reductions. Raytheon expects the tethered model to see action in a logistical role, hoisting heavy supplies, in about five years. A nontethered version could follow by 2020. — ALEX HUTCHINSON

QUICK HITS



IT'S ALL IN THE WRIST

→ Getting an aerial view of a battlefield may become as easy as checking the time. During a demo at

the Army's Fort Dix, N.J., test center, soldiers wearing light, flexible screens strapped to their wrists were able to watch full-color video streaming in real time from a camera mounted on an unmanned aerial vehicle. The 4.3-inch screens, built by a Georgia-based unit

of L-3 Communications, use organic LED technology that consumes about one-quarter of the power used by conventional OLEDs. The Army is testing eight prototypes, part of a program to develop light-weight, rugged communication systems for soldiers in the field.



TIMELESS TOOLS

→ Our Stone Age ancestors were better materials scientists than we give them credit for. A team of

archaeologists studying the microscopic scars on 75,000-year-old spear points found in South Africa confirmed that they had been pressure-flaked. Prehistoric man heated and honed quartz- and silica-rich rocks to make tools 50,000 years earlier than previously thought.

IN THEIR OWN WORDS

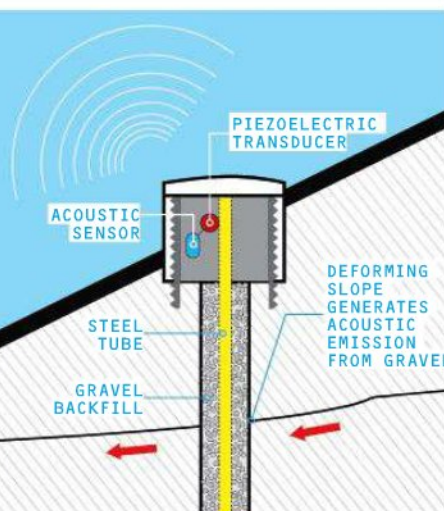
"Human age can be estimated from blood with reasonable accuracy,"

says Manfred Kayser of the Erasmus MC: University Medical Center Rotterdam, in the Netherlands, announcing a process that forensic specialists can use to identify victims when bones or other body parts are not available. The method counts the declining number of T-cell receptors, part of the immune system that identifies foreign invaders, to determine age.

PREDICTING DISASTER

An Ear to the (Moving) Ground

→ Geotechnical experts in Britain have developed a landslide early-warning system triggered by noise. Engineers insert a long steel tube into a borehole and surround it with gravel. When soil starts to shift, the sounds of the gravel grating travel up the tube, where they're detected by a piezoelectric transducer that converts the sound waves into a signal that can be analyzed by a computer. When the subterranean noise builds beyond a threshold, an alarm is sent via text to officials who can stabilize the area, evacuate nearby homes or close a road. Commercialization could take two years.



SPACE RECORDS

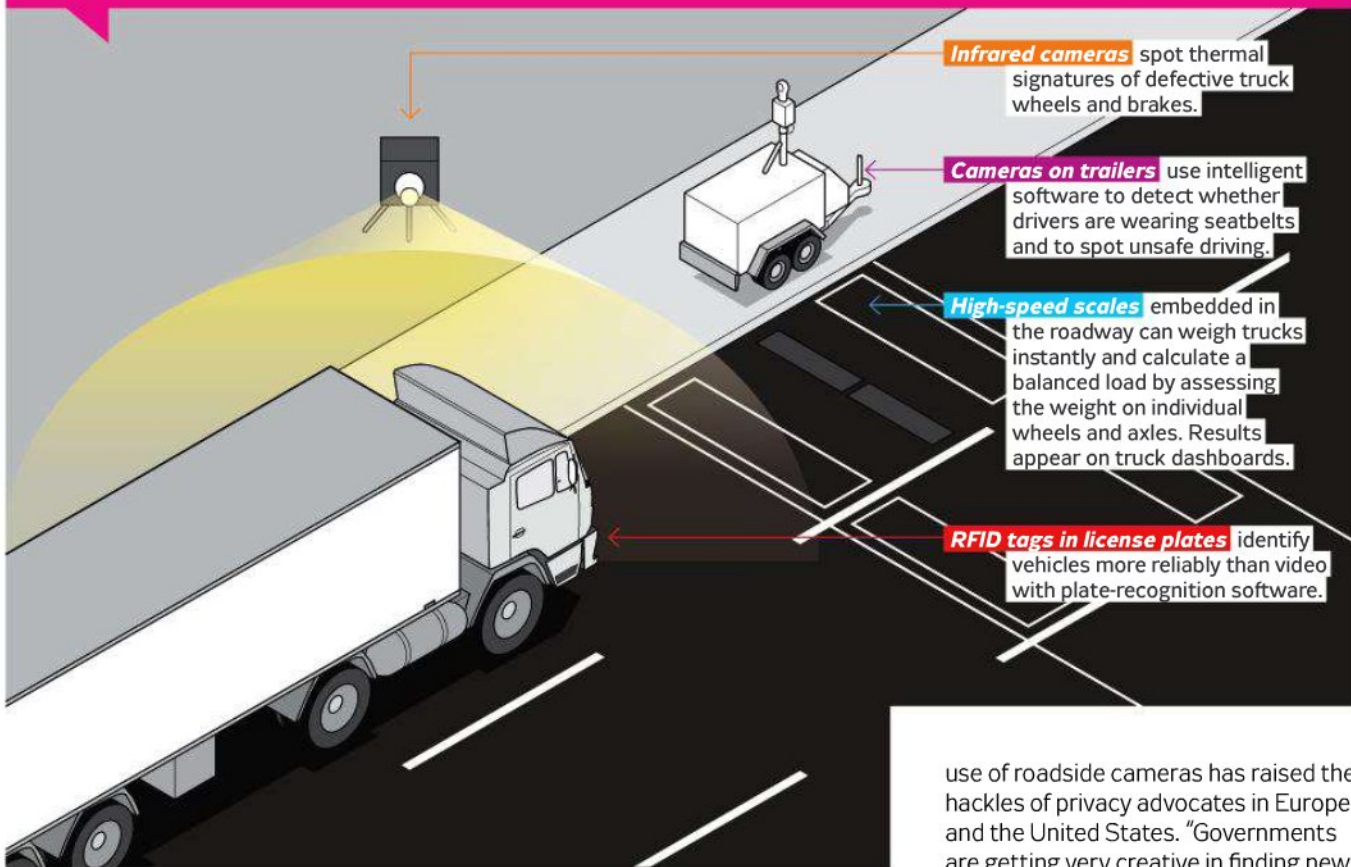


3645 Days
(and counting)

The International Space Station (ISS) celebrated its 10th anniversary as an occupied station in November, becoming the longest-duration continuously manned outpost in spaceflight history. The Russian Mir, staffed from 1989 to 1999, held the previous record. The ISS will be in operation until at least 2020.

← Astronauts Julie Payette and Robert Thirsk in a lab aboard the ISS.

FUTURE OF DRIVING



Infrared cameras spot thermal signatures of defective truck wheels and brakes.

Cameras on trailers use intelligent software to detect whether drivers are wearing seatbelts and to spot unsafe driving.

High-speed scales embedded in the roadway can weigh trucks instantly and calculate a balanced load by assessing the weight on individual wheels and axles. Results appear on truck dashboards.

RFID tags in license plates identify vehicles more reliably than video with plate-recognition software.

Europe's Closely Watched Roads

AN INTERNATIONAL PROGRAM TO IMPROVE HIGHWAY SAFETY INCREASES ROADSIDE SURVEILLANCE—AND AGGRESSIVE LAW ENFORCEMENT.

European Union traffic-safety officials have turned to advanced image-recognition technology to make roads safer—and to keep an extremely close tab on drivers. The \$11 million pilot project, under way in Finland, Germany, Austria and France, uses cameras to scan vehicles for seatbelt use and precision scales to weigh trucks as they drive past. That data is either beamed directly to authorities so they can issue tickets or flashes on a driver's dashboard. The effort aims to reduce fatalities caused by speeding, which kills 11,000 Europeans annually, and enforce seatbelt use, which could save 10,000 more lives each year. But the ubiquitous

use of roadside cameras has raised the hackles of privacy advocates in Europe and the United States. "Governments are getting very creative in finding new ways to generate revenue at the expense of motorists," says Gary Biller, executive director of the National Motorists Association. "Enforcement by camera inconveniences responsibly minded motorists and rarely, if ever, modifies the behavior of offending drivers." He adds that elements of what the Europeans are researching have been suggested in the United States: For example, Oklahoma last year proposed to snare uninsured drivers with highway cameras. The effort collapsed in part over disagreements as to where the revenue would go. Field tests of the European program will end this year. — A.H.

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FUNCTIONAL ROBOTICS



The Fingerless Grip

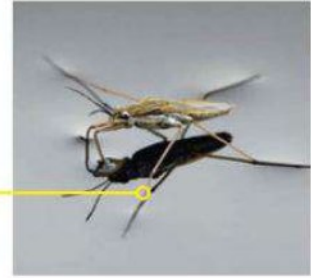


The challenge:

Design a robot hand sensitive enough to grip an uncooked egg and precise enough to pick up a coin.

The solution:

A latex party balloon filled with coffee grounds. Grainy materials like coffee grounds or sand can act as a liquid or a solid. (Think of how rock-hard a bag of vacuum-packed coffee is and how easy it is to pour the grounds after the seal has been broken.) Researchers at Cornell University, University of Chicago, iRobot and DARPA designed a gripper that allows the grains in the balloon to form around an item. By applying a vacuum to the sack, which jams the coffee grounds into a solid-like state, the gripper gains a firm hold on the object. The vacuum causes the balloon to contract by less than half a percent, giving its grip that extra oomph without applying too much pressure. — VALERIE ROSS



MATERIALS SCIENCE

Enemies of Ice

→ Researchers at Harvard University have developed a material that prevents freezing rain from forming ice at temperatures as low as minus 22 F. Using high-speed cameras, they studied the way natural textures, including the bristles on the legs of water striders, repel water, then designed nanoscale patterns mimicking them. The droplets spread out upon contact, but the surface makes most of the water bead and bounce away before it has a chance to freeze. The scientists hope to create anti-icing coatings that could eliminate the need for salt, chemical sprays or heating systems used on airplane wings and roadways.

Rare-earth elements (REEs) are not so rare after all.

The U.S. relies almost entirely on China to supply REEs, 16 elements that are used in manufacturing electronics and military systems. But as China consumes more of its own REEs, the Pentagon and U.S. industry are eager to tap other supplies. The U.S. Geological Survey, in a first-ever evaluation, says the U.S. has 13 million metric tons of REEs. Processing these elements is dirty, hazardous and complex, hampering domestic production.

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Anatomy of America's Secret Internet

Government agencies communicate via a tiered system of secure networks. After 9/11, more agencies gained access to these channels of information, but that sharing came with increased risk of a leak—as evidenced by last year's WikiLeaks disclosures of SIPRNet documents. The Pentagon estimates there are a half-million SIPRNet users; it takes only one to cause a breach.

— SHARON WEINBERGER

SECURITY LEVEL

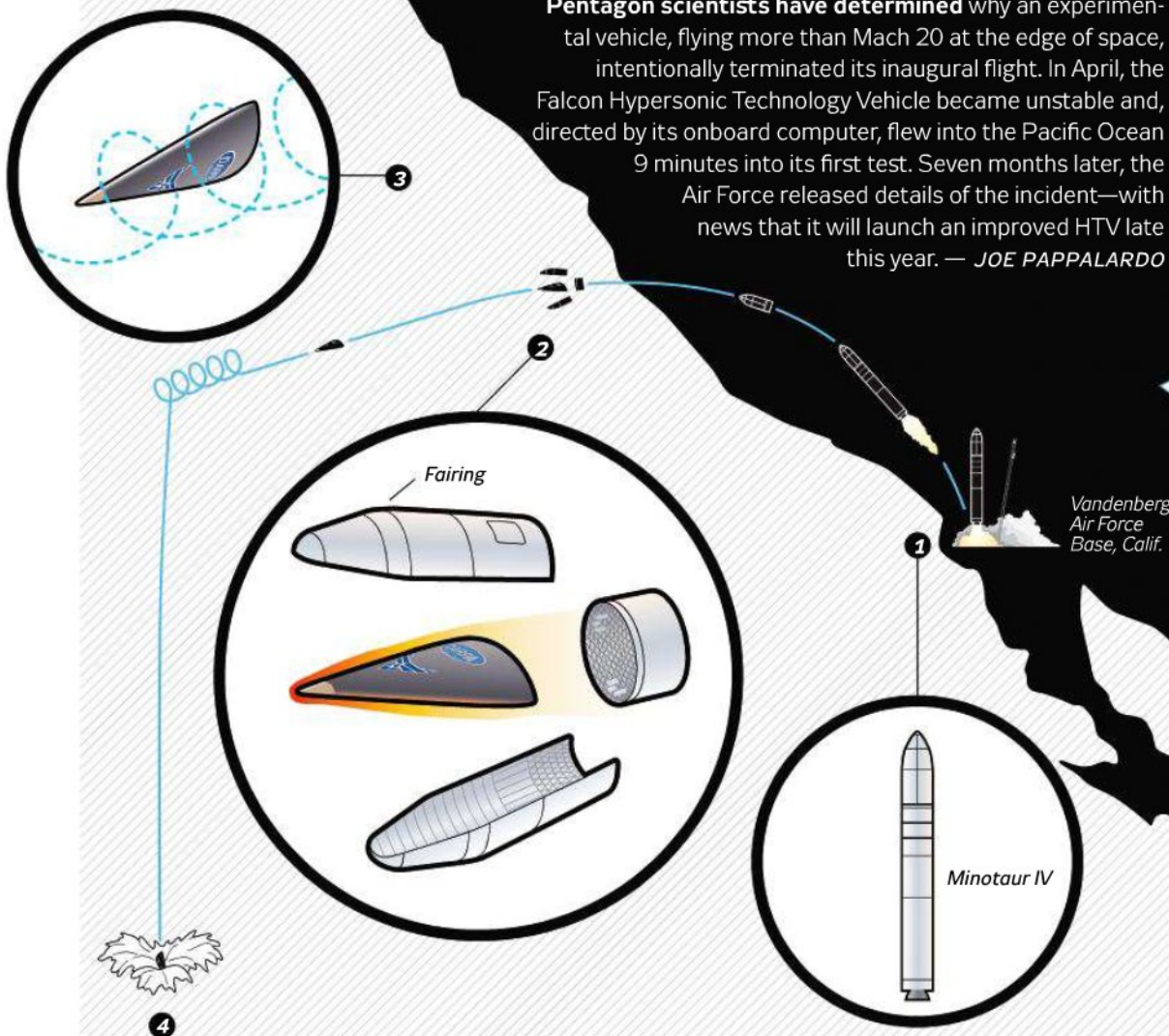
Low	→	Non-Classified Internet Protocol Router Network (NIPRNet) A Defense Department computer network used to share unclassified information. <i>Sample uses:</i> e-mails between Pentagon officials discussing unclassified meetings; unclassified military websites.
Medium	→	Secret Internet Protocol Router Network (SIPRNet) A classified computer network for sharing information at the Secret security level. <i>Sample uses:</i> e-mails with targeting information or flight times for combat missions; classified intelligence agency websites.
High	→	Networks like NSANet and the Joint Worldwide Intelligence Communications System transmit information above Secret, up to the Sensitive Compartmented Information designation. <i>Sample uses:</i> e-mails with classified satellite imagery; sending intel field reports.

WEAPONS TESTING

CRASH
TIMELINE
April 22, 2010

Hypersonic Blowout

Pentagon scientists have determined why an experimental vehicle, flying more than Mach 20 at the edge of space, intentionally terminated its inaugural flight. In April, the Falcon Hypersonic Technology Vehicle became unstable and, directed by its onboard computer, flew into the Pacific Ocean 9 minutes into its first test. Seven months later, the Air Force released details of the incident—with news that it will launch an improved HTV late this year. — JOE PAPPALARDO



1. Launch

• The Hypersonic Technology Vehicle is launched from a Minotaur IV missile, which opens its clamshell fairing at the edge of the atmosphere to release the experimental aircraft.

2. Flight

• The HTV glides above Earth at more than 15,000 mph—roughly 20 times the speed of sound.

3. Trouble

• The aircraft unexpectedly begins to roll. This phenomenon, called inertial coupling, occurs in high-speed flights when the inertia of the fuselage overwhelms the ability of flight surfaces (like the HTV's flaps) to stabilize the craft.

4. Crash

• The HTV, programmed to ditch if its flight becomes erratic, steers into the Pacific Ocean in a crash dive. Contact is lost 9 minutes after its release from the rocket.

LESSONS

Engineers adjusted the HTV's interior layout to change the vehicle's center of gravity. On future flights, onboard reaction control thrusters will keep the craft stable.

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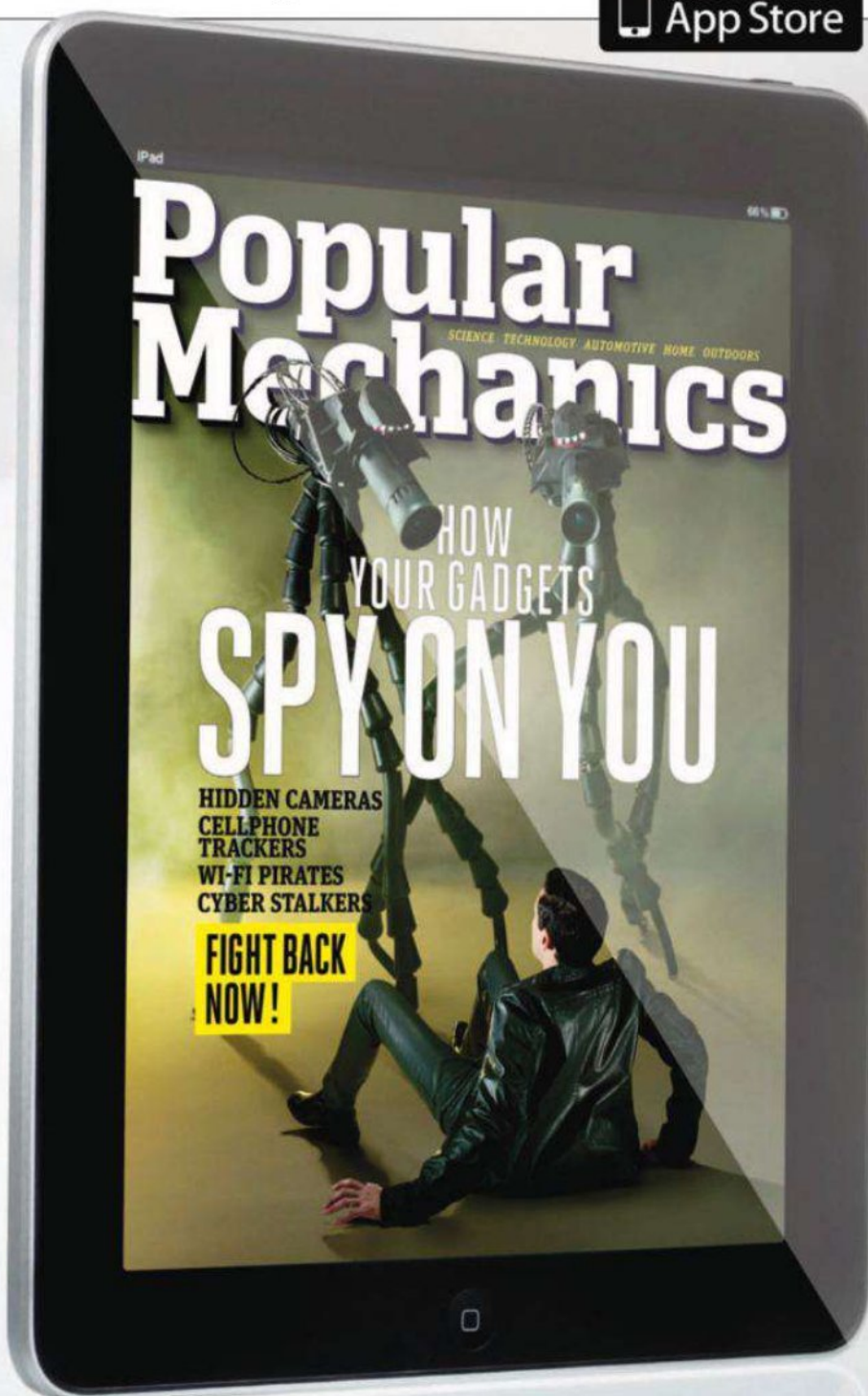


HONDA

ACCORD

Each month, the Popular Mechanics team takes every word and picture of the print issue, optimizes it for the iPad experience and adds interactive functionality to best enhance the individual stories. The result? PopMech: a must-download app! This month, don't miss our Auto Infotainment coverage.

Available on the
App Store



Sting Like a Hornet

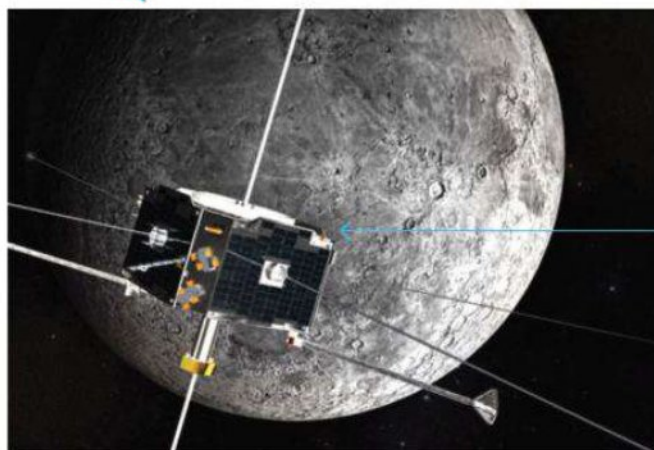
Forget Kato—the Green Hornet’s coolest sidekick is his car. The masked crime-fighting vigilante used a weapons-laden Chrysler Imperial Crown, nicknamed Black Beauty, in the 1966 television show. But script co-writers Seth Rogen and Evan Goldberg thought that for the film, due out Jan. 14, they would be forced to use a new car. “None of the versions that companies pitched were as cool as the original,” says Rogen, who stars as Britt Reid/Green Hornet. To persuade director Michel Gondry to use a ‘65 Imperial Crown, car coordinator Dennis McCarthy bought and modified one of the vehicles. Low to the ground, with tinted windows, green headlight covers and hot-rod wheels, it garnered Gondry’s seal of approval. McCarthy then had to find 28 more ‘64 to ‘66 Imperial Crowns for the production’s needs; the hunt took him from San Diego

to eastern Canada. Most of the cars were in terrible shape—more rust than steel—so the crew stripped them to the frames and added Chevrolet ZZ454 V8 engines, Race Trans Turbo 400 transmissions, Ford differentials and four-wheel disc brakes. And then came the weapons: machine guns, missiles and a flamethrower. McCarthy estimates that his team fully rebuilt 15 cars. “Black Beauty is just an Imperial on the outside,” he says. “Under the skin, it’s a race car.” By the end of production, 26 cars were wrecked; only three survived in pristine shape. Says McCarthy: “We definitely took a big chunk out of the remaining Imperials on the planet.” — ERIN MCCARTHY



Britt Reid (Seth Rogen, left) and Kato (Jay Chou) run a weapons check on the bodyless Black Beauty.

SOLAR STUDIES Second Careers for Spacecraft



→ **With their first** mission complete, two NASA spacecraft have been assigned a new job. Initially launched in 2007 to investigate solar magnetic storms, the ARTEMIS mission’s craft have now been deployed to two Lagrange points—areas where gravity from the Earth and the moon

are balanced—and they’ll remain there for six months to study the effects of solar wind on the moon. The ability to stay over one spot of the moon allows the spacecraft to make first-ever direct observations of the environment behind the dark side, the greatest known vacuum in the solar system. It can be a rough gig: One of the

spacecraft was apparently hit by a meteoroid in October while en route to its new parking spot, but it appears to be functional. After their stint at the Lagrange points, both craft will orbit the moon, taking measurements of the solar wind every other day for several years.

ERADICATION SCIENCE

Kill These Critters!

→ **Invasive species are opportunists** that spread by taking advantage of environmental disruptions, including changes in climate. Stas Burgiel, former policy director of the Global Invasive Species Program, recently co-published a paper detailing how highly adaptable alien species are often more resilient to temperature swings and droughts than native ones. For example, flooding can introduce alien fish that overwhelm existing species in rivers and lakes. Scientists are hopeful that novel control methods will protect embattled natives. "If you look back a decade, what we're doing now with biotechnology to control invasive species would seem unprecedented," Burgiel says. "In many ways, these new tools are the only hope." — AMBER ANGELLE

VARROA MITE



This eight-legged parasite sucks honeybee blood, a circulatory fluid called hemolymph, spreading deadly viruses. The mite likely arrived in the U.S. from Asia on the backs of imported queen bees in the 1980s.

Impact

The varroa mite is a major culprit in honeybee deaths; U.S. honeybee colonies have decreased from 6 million in the 1940s to just over 2 million in 2008. The extended spring and fall seasons of a warmer planet could increase the mite population.

Control

USDA scientists are studying the bee genome to pinpoint genes responsible for hygiene. Some insects clean themselves aggressively, removing the mites. Unraveling the genome may also enable breeders to instill greater disease resistance in hives.

BROWN TREE SNAKE



An Australian native, this snake slithered onto a cargo ship headed for a U.S. military base on Guam after World War II. The snake thrives in humid places.

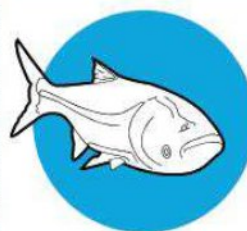
Impact

This adaptable snake destroyed the majority of Guam's forest birds and reduced bat and lizard populations, making it a notorious invasive species risk. The snake's uncanny ability to hide led to several near escapes by air and sea from Guam to Texas and Hawaii.

Control

Fearing a homeland invasion, the Pentagon is dropping toxic bait—acetaminophen pills placed in dead mice—by airplane over Guam. Scientists at the National Wildlife Research Center are studying the use of pheromones collected from female brown tree snakes as a method of monitoring them.

ASIAN CARP



Originally imported from China, Asian carp have been swimming in U.S. waters since the 1960s. The plankton-loving fish consume up to 40 percent of their body weight daily, devastating native species.

Impact

The fish have traveled up the Mississippi and Illinois rivers—to within 25 miles of Lake Michigan—and now threaten the Great Lakes. Flooding during the past few decades may have provided a means for carp to press north.

Control

The U.S. Army Corps of Engineers is installing underwater electrified barriers as wide as 160 feet at entry points to the Great Lakes. The U.S. Geological Survey is also investigating the effectiveness of using sound waves to damage carp eggs as they drift in the water.

PINK BOLLWORM



The pink bollworm first infested cotton plants in Texas in 1917. The female moth lays eggs in a cotton boll. The larvae emerge hungry and eat their way through fiber and seeds.

Impact

This parasite costs growers more than \$30 million each year in crop losses and pest control. A several-degree rise in winter temperatures could expand their range by reducing frost that deters them.

Control

The pink bollworm's resistance to genetically engineered cotton is rising, so USDA scientists sterilized 2.1 billion moths with radiation and then released them over Arizona. They repeated this for four years: The resistant insects mated with sterile partners, leading to a 99 percent reduction in the test population.



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*23 city/34 highway mpg. Based on 2011 EPA mileage estimates for Accord 4-cyl. Sedan models with AT. Use for comparison purposes only. Actual mileage will vary. [†]Car and Driver, January 2011. © 2010 American Honda Motor Co., Inc.

Accord



Upgrade

Chop Sticks

→ At 1.65 pounds, the 14-inch **Fiskars X7 Hatchet (\$28)** feels more like a razor-faced framing hammer than a log-chopping ax. But while clearing a fallen swamp maple from a bridge path, we found the tool was up to the task—and imagined it would be perfect for a hiker cutting campfire wood. The fiberglass-composite handle's flared hoof offered a sure grip as we sliced through branches up to 1 inch in diameter. But the 3-inch trunk was tougher going, reminding us that even with a hatchet this light, every stroke must count. — HARRY SAWYERS

TIP

NO SAW HANDY, BUT NEED TO CROSSCUT A LIMB? GOUGE A V SHAPE. EVERY SECOND STRIKE SHOULD SEND A TRIANGLE OF WOOD FLYING.



Dog Gone → Despite millions of years of evolution, a dog's hair still performs only two basic functions: It keeps an animal warm—and your house a mess. Taking a cue from the “revolutionary” Flowbee haircutting system, the **Dyson Groom (\$70)** attachment, which works with most Dyson vacuums, helps you head off fur balls with remarkable efficiency. Just swipe it across the animal's coat and loose hair and dander disappear directly into the vacuum.



Coloring Book

→ In a way, the new **Barnes & Noble Nook Color (\$250)** feels like a cop-out. Because it ditches the original Nook's E Ink display in favor of a 7-inch color LCD touchscreen, it yields the pure e-reader territory to Amazon's Kindle. But we're okay with that. You see, the Nook Color isn't really an e-reader; it's an app-capable tablet. And its price tag, which is half an iPad's, might prove to be its killer app.

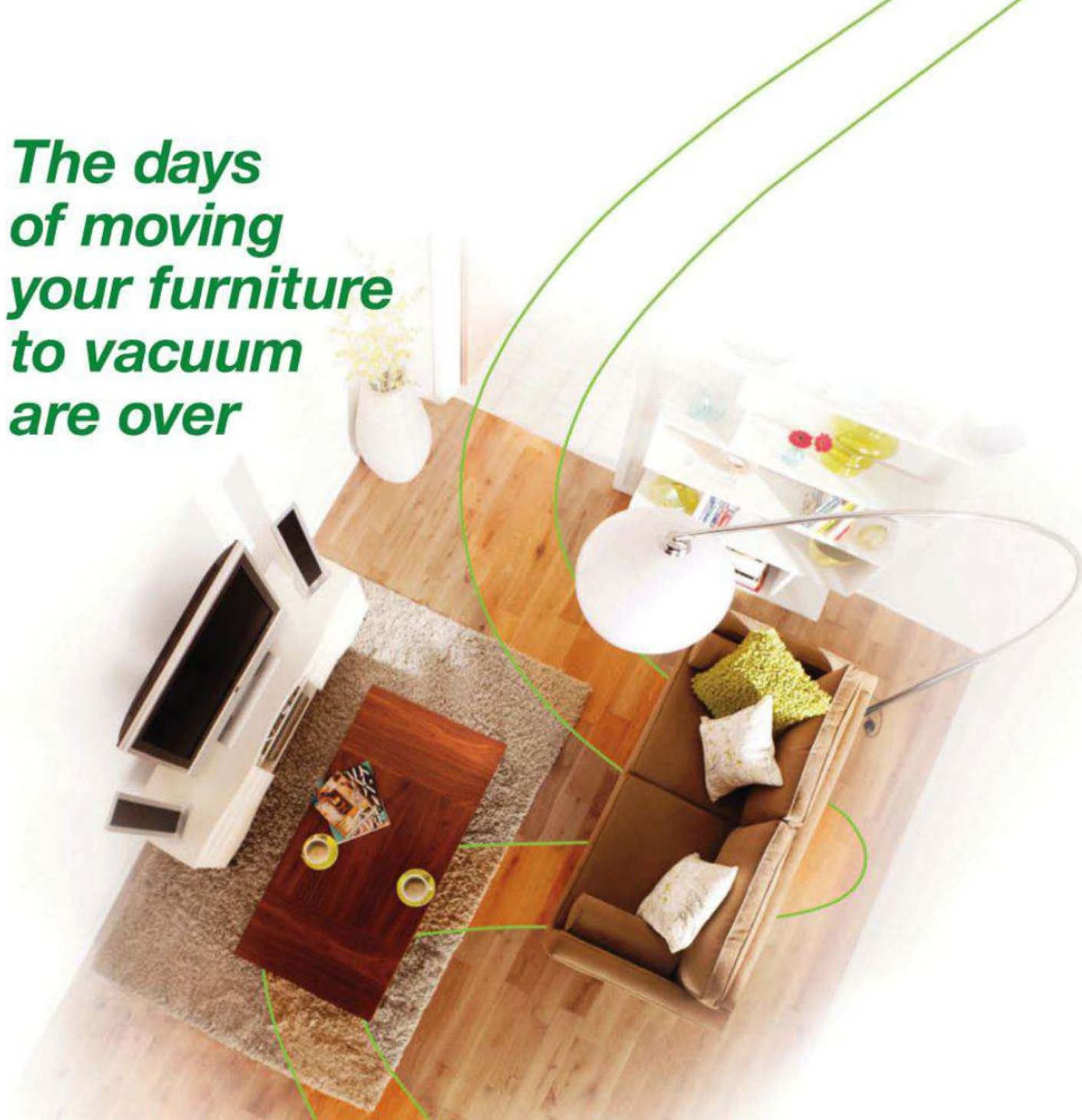


Smoothie Operator

If you're both a juice junkie and a sucker for smoothies, the **Breville Juice & Blend (\$500)** is one appliance you'll go for. Simply swap out the top of the stainless-steel base and the split-personality machine transforms from juicer to blender—without hogging up twice as much counter space. And while we're all for kitchen convergence, we realize the price makes this an appliance for serious juicers.



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UPGRADE



Nailing the Finish

WT

We were tempted to write off any changes to the classic Arrow stapler as unnecessary flourishes. But the new **Arrow T50R.E.D. (\$25)** adds game-changing firepower: It's the first manual stapler that can also drive 1-inch brad nails. The blazing crimson finish is accessorized with a cushy rubber handle, making marathon roof-felt-tacking and furniture-upholstering sessions less painful.

When in Room → Bluetooth products have a dicey reputation when it comes to audio quality. Sure, the connection is good enough for carrying on a conversation through a wireless headset, but can it deliver high-fidelity music? Well, yes. In fact, we were shocked when we cranked up the Bluetooth-equipped **Jawbone Jambox (\$200)**, which is easily one of the better-sounding (and loudest) battery-powered compact speakers we've ever heard. Pair it with an MP3 player to DJ from across the room, or sync it with an iPad or laptop to step up from the puny built-in speakers. Bonus: The Jambox's small size (it's just 6 inches wide) and 8-hour battery life make it a road warrior's dream.



Triple Duty

→ Hard to believe it took so long, but the **Escort Passport iQ (\$650)** is the first radar/laser detector with built-in GPS navigation.

The Problem With Proprietary Connections

One reason Apple is the envy of the electronics industry is its accessory ecosystem, which forces partners to cough up serious cash if they want to make products compatible with the iPhone and iPod's proprietary dock. So it's not hard to understand why Cisco would want in on this kind of action with its Flip pocket camcorders. Enter the FlipPort: a new connection that enables the mega-selling devices to hook up with external microphones, portable chargers, microprojectors and more. At press time, only the 8 GB version of the **Flip UltraHD Camcorder (\$200)** was equipped with the jack, but it is expected to spread to the rest of the line over the next year. For Flip fans, this is a mixed blessing: While proprietary connections can ensure that attachments work wonderfully, companies have been known to abandon unprofitable standards, leaving early adopters out to dry. And when accessory makers have to pay to make compatible products, that added cost is often passed on to consumers. Our suggestion: If you're thinking of investing in pricey add-ons, wait a generation to make sure the standard sticks.





Rebooting Windows → For years, while Apple and Android peppered the market with flashy new phones, Microsoft appeared to be lagging behind with its Windows Mobile platform. Now that we've had a chance to use the new *Windows Phone 7*, we must concede that "waiting patiently" would be a better choice of words. The interface is intuitive and inspired, melding the best elements of the Microsoft ecosystem: From the Zune portable-media line, there's a stellar music and movie player; from Xbox, gaming-centric DNA and the ability to tap into your Xbox Live profile; and from Microsoft Office, a robust productivity suite (you can even use the phone to edit a PowerPoint presentation). And though it's too soon to tell if the Microsoft app store can attract enough developers to compete with the Apple and Android catalogs, the platform is off to a promising start.

Driven to Extremes

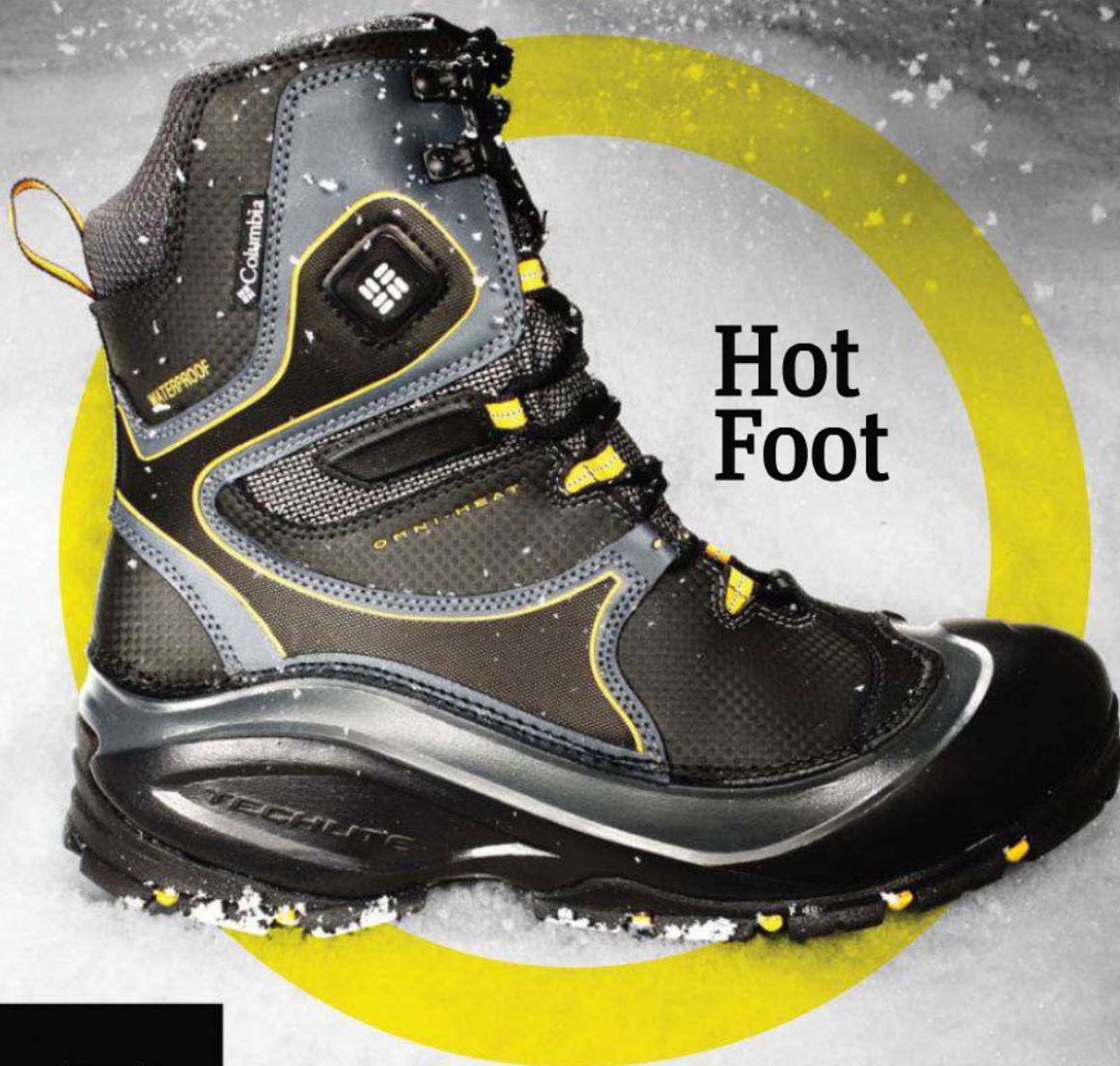


A few drops of water or a little bit of dust won't faze the average drill driver. But for serious plumbing work or heavy-duty outdoor jobs, you need something with a stronger shell. The 14.4-volt **Panasonic ToughIP EY7441LZ2S Drill & Driver (\$320)** is rated by the International Electrotechnical Commission, which sets the standards for electronic tools, to stand up to serious drenching and debris barrages. Oh, and it can drive 330 screws on a single charge.



Done Playing Games

→ Here's the secret behind *Rock Band 3*: In its most basic mode, it's a game much like its button-mashing predecessors. But pair it with the **Squier by Fender Stratocaster Guitar Controller (\$280)** and it suddenly becomes a full-on musical training system, allowing players to learn real songs on a real guitar—without shelling out for a real instructor.



Hot Foot

Electrically heated winter gear takes a step forward with the **Columbia Bugathermo Techlite (\$350)** boots. Hoth-grade galoshes with built-in rechargeable batteries to keep toes toasty in even the most extreme environments (like, minus 25 F extreme). And while you may never find yourself trekking the surface of some far-off frigid planet, you can be thankful, at least, for the obsolescence of the prior-gen tech: the disposable foot warmer.

Sound Plan → Modern TVs have a lot to brag about. But even in this age of 3D screens, infinite contrast ratios and streaming Netflix, the speakers in a typical television are, in a word, pathetic. This is why most serious home theaters have a separate sound system—and why our living rooms are filled with wires. So we appreciate the 46-inch, 1080p **Bose VideoWave TV (\$5350)** for its integrated, room-filling, virtual-surround-sound system. Yes, it's pricey—but the VideoWave has earned bragging rights. Let's hope other manufacturers step up to the challenge. Seriously, we're tired of all those wires.



Little Lab

→ There was a time when a kid's allowance could buy a science kit with uranium ore and a Geiger counter. For obvious reasons we don't advocate the return of that particular item. But we're definitely in favor of more exciting products for budding lab rats. **Connor's Kits for Kids (\$15 each)** were invented by a fourth-grader (he's now 16) who shares our sentiments. His kits come with all the necessary supplies to grow crystals, brine shrimp or a Flubber-like polymer slime.



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     **GET CONNECTED**

Digital Preview

BY SETH PORGES

2011

Every January, the gadgetheads of the world converge on Las Vegas for the Consumer Electronics Show, where the top tech companies unveil their most prized products for the coming year. It's a battle royal for buzz—and only the strong survive. PM picks the devices destined to rise above the din.



Nike+ Sportwatch GPS

(price not set) →

Serious runners keep tabs on their pace and distance with GPS-enabled gear, but reception can be spotty (among tall buildings or trees, for instance). This watch never stops mining data, thanks to an in-shoe sensor that takes over in the event of GPS signal loss.

Casio Tryx Camera

(\$250) →

The classic camera brick has long been in need of a refresh, and Casio delivers a deft twist with this contorting 12-megapixel (1080p for video) shooter. A multitude of hinges enables it to fold, bend, hang from a hook, perch on a table and even flip its 3-inch screen for a well-aimed self-portrait.



Mavizon Autobot (price not set) → Plug the Autobot into a vehicle's diagnostic port and it beams any detected mechanical problems to an iPhone or Android app—in plain English, not impenetrable car-manual lingo. Even better: The device's GPS chip allows you to track your vehicle. You know, just in case.

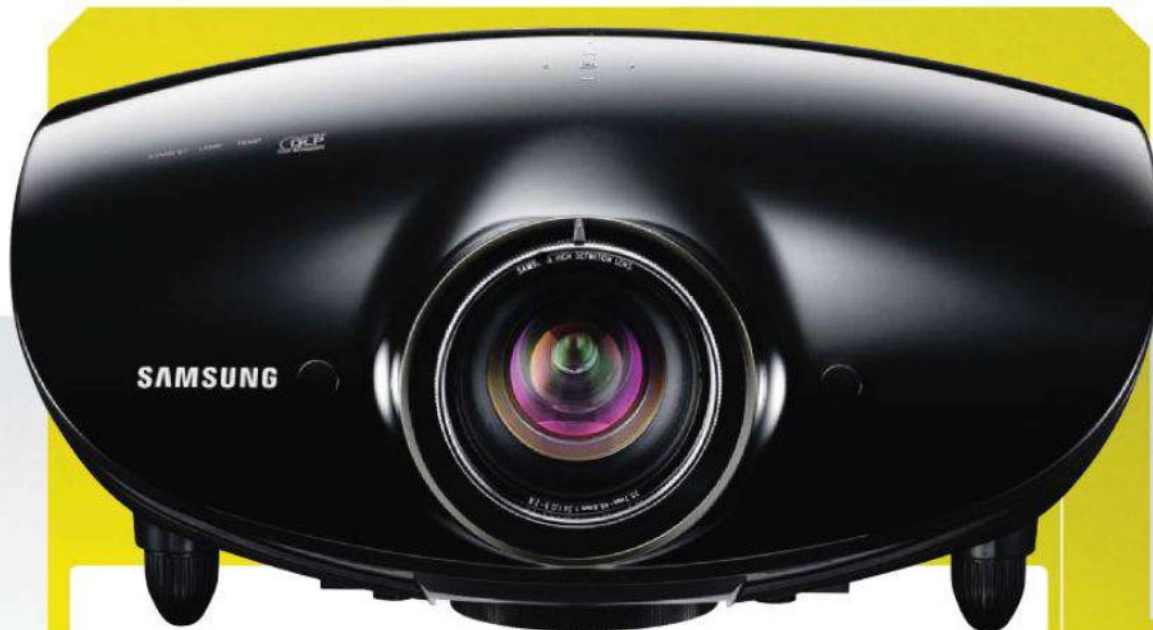


iHome iWi Speaker

(\$300) →

This year's tech forecast calls for a flood of sound systems that work with Apple's new AirPlay system, which wirelessly streams music between devices. This little number, equipped with a rechargeable battery for portability, is one of the first.





Samsung SP-A8000 3D Home Theater Projector (price not set)

→ 3D TVs can provide great visuals, but nothing matches the immersive experience of a projector. Samsung steps up with one of the first units that can bring 2D content into the third dimension. And while the tech is far from perfect (watch any auto-converted 3D for too long and you'll feel a bit woozy), it's still an impressive stopgap until more 3D Blu-rays are released.

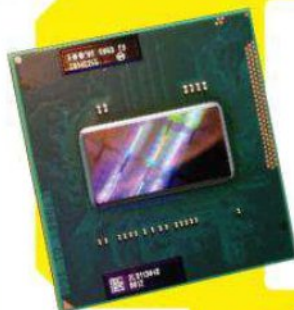


LG LW6500LED HDTV (price not set)

→ The active-shutter glasses needed to view most 3D TVs cost a bundle, require batteries and are heavy enough to leave divots on the bridge of your nose after extended viewing. This 3D TV lightens the load—on your schnoz and your wallet—by using the same cheap, lightweight glasses as 3D theaters.

Iomega Superhero Dock and Charger for iPhone (\$70)

→ Backing up an iPhone is painless: Just leave it plugged into iTunes and the process takes place automatically. But a surprising number of people forgo this simple step—and suffer if they lose or break their phone. This iPhone dock works double duty, charging while stashing your contacts and photos onto an SD card. Up next: BlackBerry- and Android-compatible units.



Intel Sandy Bridge Processors

→ The fact that Intel's latest chips are its fastest yet should come as no surprise. What is novel: They cut the amount of time it takes to transcode video in half, thanks to a new architecture that places the graphics and computer processors onto the same piece of silicon.

Garmin GTU 10 GPS Tracker (\$200)

→ A Garmin rep told us that this tiny GPS module was initially invented for pet owners to track their furry friends. But we think its small size (like, Bic lighter), long battery life (up to four weeks) and waterproof construction make it suitable for much more. Stuff it in the pocket of a potentially wayward child, pop it in the glovebox as a low-cost LoJack, or hide it in a suitcase full of cash to relive your *No Country for Old Men* fantasies. A Web interface makes it easy to home in on the device's location.



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\$28,190



++ **PA TEST DRIVEN**

The reborn Ford Explorer might look rough and rugged on the outside, but beneath the skin, this six-passenger SUV has more in common with Ford's Taurus sedan than with a truck. The Explorer now rides on a beefed-up version of the Taurus's chassis, complete with the same 3.5-liter V6, here delivering 290 hp. Compared to the last Explorer, the new model is quiet and rides smoothly. But it has a fairly athletic suspension for twisty road adventures, too, as we found out testing a new Explorer at Ford's Romeo, Mich., Proving Ground. Climb into the back seat and you can recline in comfort. The third row, however, is a bit tight for adults. The Explorer can be positively loaded with kit, including optional all-wheel drive and a towing package good for 5000 pounds. — **BEN STEWART**

2011 Lexus CT200h



Prius Knockoff

The Lexus CT200h, which should start just below \$30,000, is a compact hybrid hatchback—not quite as big as a Toyota Prius, but still able to fit two adults up front and a couple of kids comfortably in its back seat. Like the Prius, the CT200h uses an efficient 1.8-liter 98-hp four-cylinder with an electric motor and generator and NiMH batteries. It then adds an aluminum hood, hatch and bumper reinforcements to keep things light, and its slick 0.29 coefficient of drag conspires for 42 mpg city/41 mpg highway. An EV button provides all-electric drive for a mile or so before the engine kicks in, but basically there are two driving modes: sluggish Eco (which maximizes mileage) and a much speedier Sport, which sends up to 134 hp to the front wheels, making the CT200h capable of getting to 60 mph in less than 10 seconds and on to a top speed of 112 mph. But what most impressed us was the fuel meter, which estimated our range at 710 miles. — G.E. ANDERSON

2011 Infiniti G25



CHEAP THRILLS

Price trumps performance for many drivers. To cite one example, the lower-horsepower, more affordable version of a manufacturer's sport sedan usually constitutes close to 80 percent of that model's sales. So Infiniti slipped a 2.5-liter V6 into the G sedan and created the \$31,835 G25, giving the G37 a less expensive sibling. With 218 hp, the G25 gives up 110 ponies to the G37, a deficit that's mitigated only slightly by an

84-pound weight reduction. So there's no forceful shove to the seat when the driver pins the gas. But the little V6 is a gem. It revs freely to redline with a sweet-sounding exhaust and less vibration than the big motor. It may not be as quick as the G37, but since the G25 has the same suspension, it's got the sharp steering and tight handling of its sibling. Plus, the G25 gets better mileage—29 mpg on the highway. We won't be surprised if it becomes Infiniti's top seller. — B.S.

POCKET MINIVAN

Minivans have long since stopped being mini, which has created a niche for smaller, more efficient vehicles like the current Mazda5 and the Ford Grand C-Max, which is due later this year. Ford's still working out final U.S. specs—the C-Max is on sale now in Europe—but we know that the C-Max is 2 feet shorter than a Honda Odyssey and will most likely

employ a turbo 1.6-liter four-cylinder, automatic gearbox and front-wheel drive. You don't give up minivan utility: Nifty folding seats make for a flexible interior, and sliding rear doors provide easy access. Plus, its smaller size means it drives more like a car: It's engagingly nimble. If a well-equipped version is priced under 25 grand, Ford could have a minor hit.

— TYGHE TRIMBLE

2011 Ford Grand C-Max



News Flash....**Government Gets Something Right****Super Light Titanium Timepiece Loses Only One Second Every 20 Million Years.**

BOULDER, Colorado The U.S. government has engineered the most ingenious, most accurate clock in the world: the F-1 U.S. Atomic Clock in Boulder, Colorado. Our extraordinary new Stauer Titanium Atomic Watch utilizes the transmissions directly from that remarkable cesium fission atomic clock to report the most precise time. This scientifically advanced timepiece will gain or lose only one second over a 20 million-year period. It is that accurate! This perfectly tuned technological invention with the super light strength of titanium is now available for UNDER \$200.

Super Light Titanium has two big advantages over steel. One is corrosion resistance and the other is that titanium has the highest strength-to-weight ratio of any metal, which means that titanium is approximately 45% lighter than steel. But every other titanium watch that we can

find is priced at over \$400, and none of those are nearly as accurate as our atomic movement. Stauer has decided to bring these resources together in a timepiece that has the most accurate movement available today. You'll never have to set this watch. Just push one of the buttons and you are synchronized with the atomic clock in Colorado, and the hands of the watch move to the exact time position. The sleek black textured dial has luminous hands and markers plus the timepiece is water resistant to 3 ATM.

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Perfectly Unremarkable

2011
Nissan Leaf



We had already driven the Leaf on short hauls, but only recently did we get the chance to pilot the car long enough to drain the battery. By now you know the basics: An AC motor puts 107 hp and 207 lb-ft of torque to the front wheels, with juice coming purely from a 600-pound lithium-ion battery pack located beneath the front and rear passenger seats. With no gear shifting, acceleration is linear and smooth; using a stopwatch, we timed the Leaf from 0 to 60 mph at 10 seconds with the gear selector in the D mode. We even zipped the car up to an indicated 95 mph—and saw the range meter drop a mile every few seconds, giving us a brief taste of range anxiety. In all, we traveled 70 miles and the meter said there were still 12 to go. To make the most of the range, however, drivers should engage Eco mode, which retards “throttle” application and boosts regenerative braking. The Eco mode and spare use of the climate-control system should deliver the claimed 100-mile range. What impressed us most was how completely conventional the Leaf feels. It’s in no way a sporting machine, but it performs and drives like any other roomy and practical hatchback, although one that’s nearly silent in its operation. Starting at \$25,280 (after a \$7500 federal rebate), the Leaf is the first EV that we’d consider buying. — G.E.A.

CUT-RATE CHOPPER

✦ The latest trend among motorcycles is the factory-engineered chopper, such as the new Star Stryker. These are bikes that take a vanity feature—like raked-out front forks—and attempt to

engineer around the mechanical compromises. Choppers can be notoriously diabolical to ride, but the Stryker exhibits no such evil traits. The machine even corners reasonably hard, with more clearance than most bikes of the genre. The

liquid-cooled 1.3-liter V-twin has counterbalancers to smooth out the irregular power pulses yet still barks from the exhaust pipe. The best part could be its price: \$10,990 to start, which is over \$1000 less than Honda’s Fury. — BASEM WASEF

2011 Star
Stryker





When machines start driving machines we'll consider a change.

Computers can measure performance. But computers can't feel. They don't have a pulse. Which is why Infiniti has a Master Driver, recognized by the Ministry of Japan for his extraordinary skill. His sole job is to provide engineers with human feedback. Emotional feedback. One drive in a G Sedan, Coupe, Convertible or the new G25 Sedan, and you'll instantly feel the exhilarating difference he makes. This is inspired performance. This is the way of Infiniti.



Learn more about the new G25 and the remarkable G Line at InfinitiUSA.com.

Vehicle shown is G37 with Sport Package. Always wear your seat belt, and please don't drink and drive. ©2011 INFINITI.



Shodo art by Masako Inkyo



INFINITI.

Inspired Performance™

2012 Yamaha
Super TenereAWAITING
ADVENTURE

✦ The Super Tenere combines a beefy, 1.2-liter two-cylinder with an off-road-worthy frame and suspension. This is the bike that can ply interstates and explore unpaved backcountry, although it's not really well-suited to hard-core dirt use. On the highway, it's exceedingly smooth, with enough power—108 hp—to maintain 80 mph. Bonus: an adjustable windscreen that really works. Off-road, things get dicey. The 7.5 inches of suspension travel cushion jolts, but the Yamie's 575-pound weight hampers aggressive dirt riding—and heaven forbid we fall over and have to muscle it upright. At least, however, there are electronic riding aids, like linked antilock brakes and a traction-control system. Overall, the Super Tenere will take you nearly anywhere you want to go, a capability well worth the \$13,900 price. —B.W.

Mini M3

2012 BMW
M Coupe

MW's M3 is about to get a little brother, a hot-rod version of the 1 Series. Instead of a rev-happy V8, though, it makes do with a twin-turbo 335-hp 3.0-liter inline six from the Z4 sDrive35is. As a sporting machine, the M Coupe's only transmission will be a six-speed manual when it goes on sale next year, priced in the low 40s. The hydraulic power steering in the early prototype we drove felt refreshingly direct and responsive, building resistance off-center and when we dove into corners. The turbos muffle much of the exhaust noise, and the cabin remains eerily quiet at full throttle, considering the explosive speed. Call us old-fashioned, but we'd like more of a soundtrack to accompany this much driving enjoyment. Especially considering that the M Coupe will be faster around Nürburgring than the M3. —REX ROY

TWO-DOOR
INDULGENCE

✦ A pair of new turbocharged V8s now power Benz's pricey yet understated CL Coupe. The CL550's (\$114,025) V8 uses direct fuel injection to belt out 429 hp—a 12 percent improvement—yet still delivers 10 percent better fuel economy. But the new powerplant in the CL63 (\$151,125) is the real corker. It arrives with 5.5 liters and a much sharper state of tune, thundering out 536 hp and 590 lb-ft; the latter arrives at a staggeringly low 2000 rpm. A seven-speed slushbox coupled to the engine by a torque converter (CL550) or a wet clutch (CL63) is the only transmission. In either guise, the CL shrinks distance and downplays speed. Both engines offer up impressive response and only the slightest hint of turbo lag, making the Benz coupe the perfect ride for those who don't need to advertise their arrival.

—SAM SMITH

2011 Mercedes-Benz
CL63

2010 Lamborghini Sesto Elemento Concept



Forged Composites

Carbon-fiber composites are strong and lightweight, but they are presently too expensive for everyday cars. Forged composites just may fix the expensive part, bringing carbon construction to the mainstream. *BY BEN WOJDYLA*

Carbon fiber's high strength-to-weight ratio is one reason the composite material is often cited as a way to reduce vehicle weight and therefore fuel consumption. Carbon fiber, however, is expensive—more than 20 times the cost of steel—and traditionally requires labor-intensive manual layups to produce parts. An unlikely partnership between Callaway Golf and Lamborghini has resulted in a new type of carbon-based composite that goes by the curious name forged composite, and it just might be the breakthrough needed to bring carbon-fiber parts to the mainstream. Forged composites start with short carbon threads, about half an inch long, that are suspended in a vinyl-ester resin. The resultant gooey slurry is amorphous and can be injected into molds like plastic and take the shape of its container. Two heated mold halves cure the resin while slowly applying up to 6 tons of pressure. The prototype Lamborghini Sesto Elemento will serve as a testbed for this material. The car's forged-composite passenger

compartment was made in about 8 minutes, compared with 6 hours for a typical carbon-fiber chassis. There are some drawbacks, notably a reduction in tensile strength partly because the strands are shorter than in typical carbon-fiber cloth and are arranged randomly rather than in line with the load. Dr. Alan Hocknell, Callaway's senior VP of research and development, said that modifying the part design can counter this shortcoming. To prove the point, many of the Sesto's suspension pieces are forged composites. The experts we talked to expressed cautious optimism. "Carefully designing the injection nozzles and the mold to ensure that most of the fibers are in the right direction will be critical to retain strength," says Kazuhiro Saitou, a professor of mechanical engineering at the University of Michigan. If the Sesto and its composite parts survive testing, Lamborghini might produce a small number of cars at a likely high-six-figure price. Perhaps the material will one day trickle into cars the rest of us can buy.



A new carbon-based material called forged composite is produced from a viscous slurry of carbon strands and resin that's poured into molds. The process can drastically reduce the cost of making lightweight parts.

Chrysler on the Rebound?

Once clear of its bankruptcy and partnered with Italian automaker Fiat in 2009, Chrysler embarked on a hectic campaign to replenish a cupboard bare of fresh cars and trucks. As the onslaught of new and upgraded models begins this year, these three suggest a hopeful future. *BY KEVIN WILSON*

UNCUTTING CORNERS

✦ The lackluster Sebring got an emergency reboot to compete in the tough midsize sedan segment. A smoother, lighter and more powerful 283-hp V6 option with better fuel economy was a good start. Same goes for the six-speed automatic transmission (there's one for the four-banger, too). Then engineers brought in classier materials, put together with

higher standards. Most of the suspension parts are also new, and though it's technically the same platform introduced in 2007, the car is more than new enough to warrant a new name: 200. Brand president Olivier Francois says the mission is to "re-content a brand that had been de-contented." In other words, Chrysler needs better cars—and the 200 is a step forward.



2011 Chrysler 200

2011 Dodge Durango



WORLD-CLASS SUV

✦ The Durango is one 2011 Dodge that's really all new. Five inches longer than the Grand Cherokee it shares parts with, the Durango offers third-row seating (Jeep doesn't), tows up to 7400 pounds and starts at just under \$30,000 with the standard 290-hp V6. A lowered R/T performance model sports a raspy-sounding

360-hp 5.7-liter Hemi. One slightly sour note: Chrysler's Uconnect media system is not as intuitive as Ford's Sync. Otherwise, upgraded fit and finish, materials, engineering and design make this Durango handsome, quiet, nimble and world-class—all attributes the old Durango lacked.

2011 Dodge Challenger SRT8 392



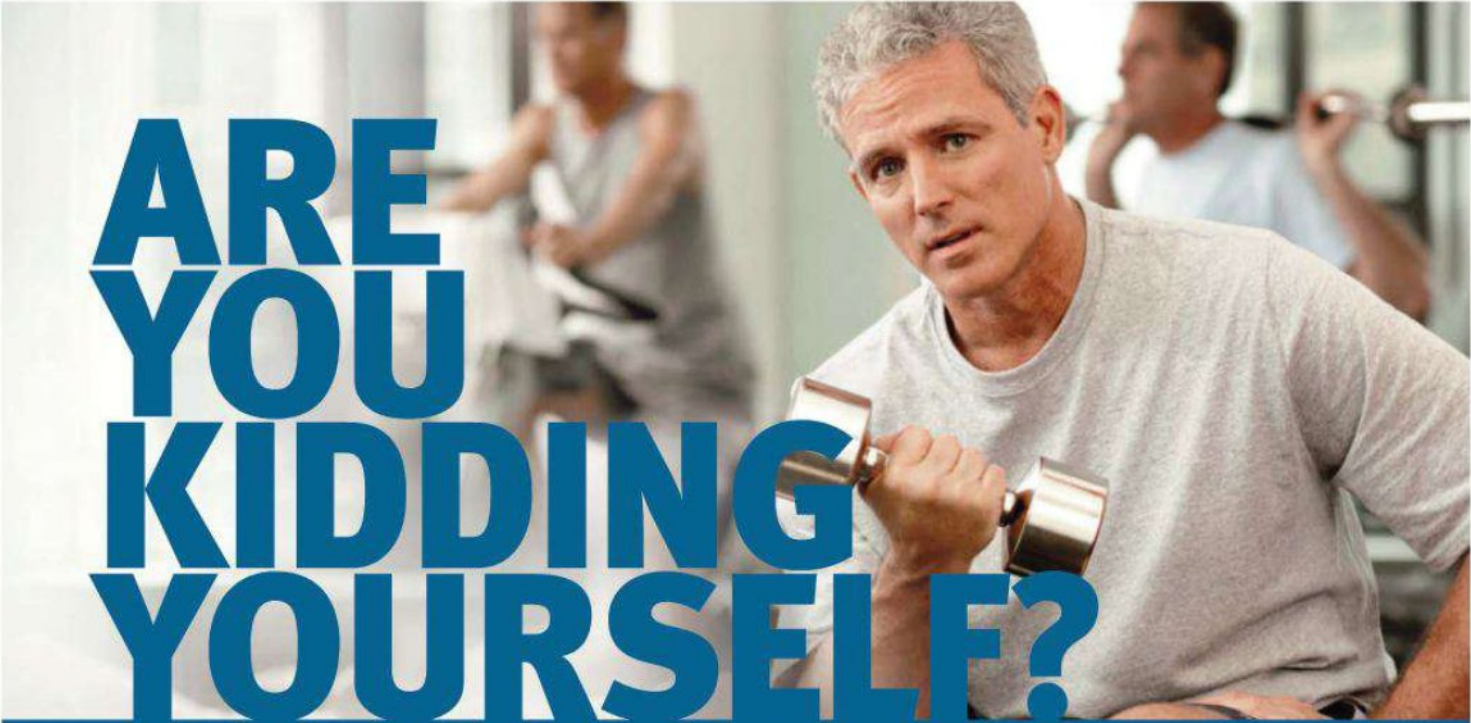
RETRO ROCKET

✦ Dipping into Chrysler heritage for evocative nomenclature, the extremists at SRT came up with 392, the displacement of the ultimate edition of the first-generation Hemi V8. Offered

as a crate engine since 2007, the 392 is now underhood in a limited-production "inaugural edition" of the Challenger that delivers 470 hp and 470 lb-ft to the street and is coupled to a six-speed manual. The new model

hits 60 mph in about 4.5 seconds—while offering improved fuel economy, thanks to the cylinder-shutoff technology. New suspension hardware delivers a sharper feel, and that engine is a brute, but the car's

4300-pound weight remains readily apparent. Thankfully, the interior upgrades make it all feel like a modern performance car. Sticking at \$42,555 all-inclusive, there will be only 1492 copies.



ARE YOU KIDDING YOURSELF?

A LOT OF PEOPLE THINK EXERCISE AND HEALTHY DIET ARE ENOUGH TO LOWER HIGH CHOLESTEROL. FOR 2 OUT OF 3, IT MAY NOT BE.

Did you know, more than 80% of people who have had heart attacks have high cholesterol? For 2 out of 3 people with high cholesterol, diet and exercise may not be enough. If you haven't been successful in trying to lower your cholesterol on your own, stop kidding yourself. Talk to your doctor about your risk and if Lipitor is right for you. You can also learn more at lipitor.com or call 1-888-LIPITOR.

- When healthy diet and exercise are not enough, adding Lipitor may help.
- Along with diet, Lipitor has been shown to lower bad cholesterol 39-60% (average effect depending on dose) and Lipitor is FDA-approved to reduce the risk of heart attack and stroke in patients who have heart disease or risk factors for heart disease. These risk factors include smoking, age, family history of early heart disease, high blood pressure and low good cholesterol.

IMPORTANT SAFETY INFORMATION:

LIPITOR is not for everyone. It is not for those with liver problems. It is not for women who are nursing, pregnant or may become pregnant.

If you take LIPITOR, tell your doctor if you feel any new muscle pain or weakness. This could be a sign of rare but serious muscle side effects. Tell your doctor about all medications you take. This may help avoid serious drug interactions. Your doctor should do blood tests to check your liver function before and during treatment and may adjust your dose.

Common side effects are diarrhea, upset stomach, muscle and joint pain, and changes in some blood tests.

INDICATION:

LIPITOR is a prescription medicine that is used along with a low-fat diet. It lowers the LDL ("bad" cholesterol) and triglycerides in your blood. It can raise your HDL ("good" cholesterol) as well. LIPITOR can lower the risk for heart attack, stroke, certain types of heart surgery, and chest pain in patients who have heart disease or risk factors for heart disease such as age, smoking, high blood pressure, low HDL, or family history of early heart disease.

LIPITOR can lower the risk for heart attack or stroke in patients with diabetes and risk factors such as diabetic eye or kidney problems, smoking or high blood pressure.

You are encouraged to report negative side effects of prescription drugs to the FDA. Visit www.fda.gov/medwatch or call 1-800-FDA-1088.



LIPITOR[®]
atorvastatin calcium
tablets

Please see additional important information on next page.

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DON'T KID YOURSELF

lipitor.com

IMPORTANT FACTS



LIPITOR
atorvastatin calcium
tablets

(LIP-ih-tore)

LOWERING YOUR HIGH CHOLESTEROL

High cholesterol is more than just a number, it's a risk factor that should not be ignored. If your doctor said you have high cholesterol, you may be at an increased risk for heart attack and stroke. But the good news is, you can take steps to lower your cholesterol.

With the help of your doctor and a cholesterol-lowering medicine like LIPITOR, along with diet and exercise, you could be on your way to lowering your cholesterol.

Ready to start eating right and exercising more? Talk to your doctor and visit the American Heart Association at www.americanheart.org.

WHO IS LIPITOR FOR?

Who can take LIPITOR:

- People who cannot lower their cholesterol enough with diet and exercise
- Adults and children over 10

Who should NOT take LIPITOR:

- Women who are pregnant, may be pregnant, or may become pregnant. LIPITOR may harm your unborn baby. If you become pregnant, stop LIPITOR and call your doctor right away.
- Women who are breast-feeding. LIPITOR can pass into your breast milk and may harm your baby.
- People with liver problems
- People allergic to anything in LIPITOR

BEFORE YOU START LIPITOR

Tell your doctor:

- About all medications you take, including prescriptions, over-the-counter medications, vitamins, and herbal supplements
- If you have muscle aches or weakness
- If you drink more than 2 alcoholic drinks a day
- If you have diabetes or kidney problems
- If you have a thyroid problem

ABOUT LIPITOR

LIPITOR is a prescription medicine. Along with diet and exercise, it lowers "bad" cholesterol in your blood. It can also raise "good" cholesterol (HDL-C).

LIPITOR can lower the risk of heart attack, stroke, certain types of heart surgery, and chest pain in patients who have heart disease or risk factors for heart disease such as:

- age, smoking, high blood pressure, low HDL-C, family history of early heart disease

LIPITOR can lower the risk of heart attack or stroke in patients with diabetes and risk factors such as diabetic eye or kidney problems, smoking, or high blood pressure.

POSSIBLE SIDE EFFECTS OF LIPITOR

Serious side effects in a small number of people:

- **Muscle problems** that can lead to kidney problems, including kidney failure. Your chance for muscle problems is higher if you take certain other medicines with LIPITOR.
- **Liver problems.** Your doctor may do blood tests to check your liver before you start LIPITOR and while you are taking it.

Call your doctor right away if you have:

- Unexplained muscle weakness or pain, especially if you have a fever or feel very tired
- Allergic reactions including swelling of the face, lips, tongue, and/or throat that may cause difficulty in breathing or swallowing which may require treatment right away
- Nausea, vomiting, or stomach pain
- Brown or dark-colored urine
- Feeling more tired than usual
- Your skin and the whites of your eyes turn yellow
- Allergic skin reactions

Common side effects of LIPITOR are:

- Diarrhea
- Muscle and joint pain
- Upset stomach
- Changes in some blood tests

HOW TO TAKE LIPITOR

Do:

- Take LIPITOR as prescribed by your doctor.
- Try to eat heart-healthy foods while you take LIPITOR.
- Take LIPITOR at any time of day, with or without food.
- If you miss a dose, take it as soon as you remember. But if it has been more than 12 hours since your missed dose, wait. Take the next dose at your regular time.

Don't:

- Do not change or stop your dose before talking to your doctor.
- Do not start new medicines before talking to your doctor.
- Do not give your LIPITOR to other people. It may harm them even if your problems are the same.
- Do not break the tablet.

NEED MORE INFORMATION?

- Ask your doctor or health care provider.
- Talk to your pharmacist.
- Go to www.lipitor.com or call 1-888-LIPITOR.

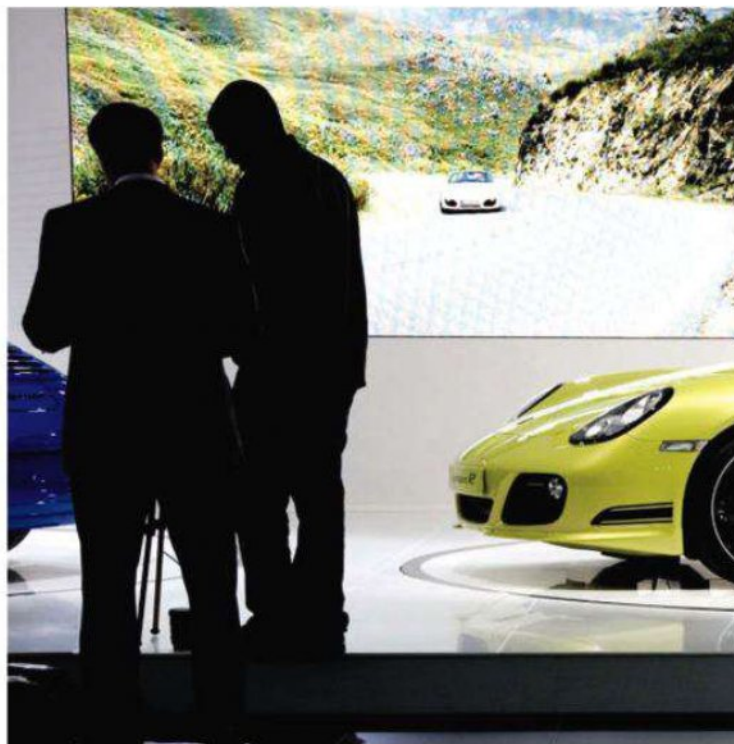
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Rx only



2011 PORSCHE CAYMAN R

✦ For the ultimate Cayman, Porsche shed 121 pounds by jettisoning extraneous items like the radio and air conditioning and bumped horsepower to 330. And in Porsche tradition, this no-frills Cayman is also the most expensive version, at \$66,300. But we want one anyway.

[2010] Los Angeles Auto Show

Kicking off the U.S. auto show season, Tinseltown welcomed several important production-car debuts and—since this is a car show—a smattering of eyebrow-raising concepts. Here are our favorites.

BY LARRY WEBSTER

1. CAMARO CONVERTIBLE

After a nine-year absence, Chevy's open-air ponycar returns with a power-operated folding cloth roof (available in black or tan). Because removing the fixed metal top reduces chassis rigidity, the convertible has several underbody reinforcements. The 312-hp V6 version starts at 30 grand, and, of course, a V8—with 426 hp—is available.

2. NISSAN ELLURE

Like most modern concept cars, the Ellure highlights its maker's future styling direction and a hybrid-electric powertrain. A supercharged four-cylinder engine and 35-hp electric motor combine for about 275 total horses.

3. SUBARU IMPREZA CONCEPT

The next Impreza will arrive within two years—we hope it retains this concept's aggressive appearance. Like all current Imprezas, the concept version features all-wheel drive, while its flat-four engine employs direct fuel injection, a gas-saving feature destined for production.

4. MERCEDES-BENZ F-CELL

EVs may just be a waypoint on the journey to fuel-cell cars like the F-Cell. The hydrogen tanks, fuel cell and 1.4-kilowatt-hour battery pack all reside under the floor, preserving cabin space. About 200 will be leased to drivers in California and Europe for what Mercedes calls a data-gathering program.

5. MAZDA SHINARI

A good concept car wouldn't be complete without some oddball verbal theme. Here we have Kodo, which Mazda says means "soul of motion." This design concept's curves and lines will be softened—hopefully, not too much, for this one is striking in the flesh—for future cars.

6. MITSUBISHI I-MiEV

The tiny EV that Mitsubishi sells in Japan, the i-MiEV, has been lengthened nearly a foot and widened by 4.2 inches for a, ahem, wider American audience. Available later this year, the all-electric runabout should have a 100-mile range and a \$30,000 pre-tax-break price.



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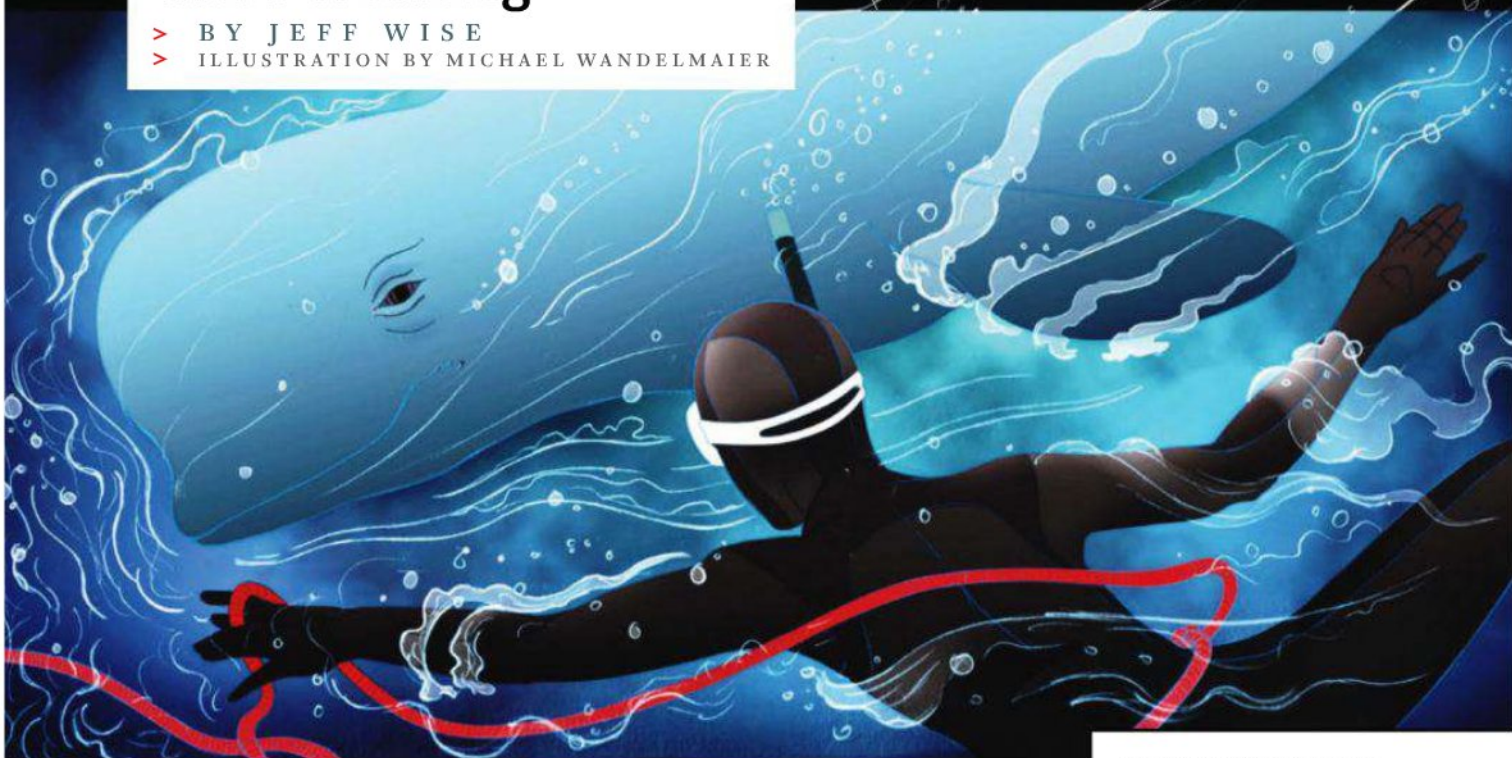


6

Gone Whaling

> BY JEFF WISE

> ILLUSTRATION BY MICHAEL WANDELMAIER



CHILLY WATER? CHECK.
RAVENOUS 2-TON MARINE
MAMMALS? CHECK. PM'S
INTREPID REPORTER SWIMS
WITH BELUGA WHALES.

O

KAY," THE ZODIAC DRIVER SAYS. "YOU GO first. Swing your feet over the side, hook your elbow into mine, and lower yourself slowly into the water. The cold is going to be a shock. Just try to keep breathing."

I look out over the wind-battered bay. All around, hundreds of beluga whales are feeding, their pale, bulbous heads arcing out of the water and then disappearing again. *Try to keep breathing.* This is the mouth of the Churchill River, on the western shore of Canada's Hudson Bay, and the water temperature is about 39 degrees Fahrenheit. Great for beluga whales, but not so great for me, even though I'm in a double-layered 7-mil wetsuit—complete with hood, boots and gloves—that's twice as thick as the one I wear for winter surfing in California.

The driver, Danielle, moves over onto the pontoon next to me and hooks my arm. As my two fellow passengers look on, I slide into the icy water. It rushes into my booties and seeps around my legs and torso. I gasp and feel a surge of panic. *Keep breathing! Huh—huh—huh...*

I'm keeping it together. Breathing in, breathing out. I lower my face. The frigid water stings the bare flesh in the inch-wide gap between my hood and my mask. Below me, murky patterns of

light shift in a diffuse glow the color of Mountain Dew. I wonder what's down there, not really wanting to know. A vivid imagination is a terrible curse.

As the rubber raft slowly motors along, I keep a tight grip on the rope attached to it, stretch out my legs and float spread-eagle. Each time I shift position, a rivulet of cold water seeps into my armpit or along my back. I peer down into the yellow glow through the tunnel of my mask and wait.

Well, I think, this is unusual.

SOME IDEAS JUST SOUND SO RIDICU-lous that they have to be great. I first heard about rope-snorkeling with beluga whales six years ago, when I was on a polar-bear-watching trip in Churchill, a town in the western province of Manitoba. "They take you out in a boat, tie a rope around you and lower

you into the water with a pod of whales,” someone told me. The description wasn’t quite accurate—you hang on to the rope—but what did I know? My curiosity was piqued.

Churchill (pop. 931) sits in a vast expanse of the subarctic, roughly 1000 miles north of Minneapolis. The town is most famous for its dense concentration of polar bears that show up every fall and wait by the shore for ice to form so they can hunt seals. And every summer thousands of beluga whales congregate at the mouth of the Churchill River to feed on schools of capelin, a small, oily fish.

Beluga are one of the stranger members of the whale family, with a prominent lump—called a melon—on the front of their heads. Between 12 and 14 feet long and weighing about 2000 pounds, beluga are roughly twice the size of bottlenose dolphins, and they have a dorsal ridge rather than a fin. The world population of 60,000 to 80,000 roam across northern waters, where they can live up to 60 years, unless eaten by their main predators, polar bears and killer whales. The Inuit are allowed to hunt them, and do. The week before my visit, hunters hauled a beluga ashore at a nearby community.

About 25 years ago, some hardy tourists on a whale-watching boat asked if they could put on wetsuits and go snorkeling with the whales. Sure, why not? In heavily trafficked areas of the world, encouraging customers to get in the water with whales and dolphins could change the animals’ behavior, but in Churchill, there aren’t enough visitors to have a huge impact. “If it’s done occasionally, and it’s not with the same animals over and over, it’s not much of a con-

cern,” says whale biologist Hal Whitehead of Dalhousie University in Halifax, Nova Scotia.

As it turns out, beluga are highly intelligent and curious creatures that gather to gambol around swimmers. Usually. On the day I take my dip, the whales have better things to do. I can hear them spouting, and when I lift my head I see their noggins cresting all around me. Underwater, however, the visibility is terrible, thanks to sediment stirred up by a recent storm. All I see are shifting patterns of light and dark.

Then, out of the depths, a circle of bubbles rushes up toward me. My



The author adjusts to Hudson Bay's frigid waters.

For the next hour, the curious whales are my constant companions, gliding past, below and to the side, behind and in front, solo and in pairs.

snorkel fills with salt water as I sputter and gasp and instinctively press myself against the hull of the Zodiac. A minute later, the white shape of a whale glides 10 feet below me. Then another appears, this time following alongside me, keeping pace with a sinuous rhythm of its long body. Again I press myself against the rubber hull. Though the beluga seem benign and peaceable, there is also something ineffably creepy about the way their ghostly forms materialize out of the murk.

For the next 10 minutes, the whales emerge and disappear; then they’re gone for good. I clamber back aboard, nearly frozen and shaking like a wet dog. As we motor to shore, Danielle lowers a hydrophone into the water.

Through a small speaker emerges the symphonic cacophony I couldn’t hear when I was in the water: a rain-forest chatter of squeaks, clicks and trills. “Sailors used to call beluga sea canaries,” Danielle says. “To me, they sound more like R2-D2.”

THE MORNING DAWNS A CLOUDY 50

F, nothing to put you in the mood for a swim, but again I squeeze into a wetsuit and climb aboard the Zodiac. The water is choppy than before, dotted with whitecaps, and there seem to be fewer whales around. But eventually a pair hovers behind us, a mother and her calf, and I slip over the side. The underwater visibility is much better. Small jellyfish drift past. And then, almost immediately, a beluga swims by, half-turning to regard me with a small, dark eye. Then a pair comes up behind me. And a group of three appears below, their bellies turned up as they float away.

For the next hour, the curious whales are my constant companions, gliding past, below and to the side, behind and in front, solo and in pairs, or in groups of three or four. The water is clear enough that I can make out every detail, from their bulbous heads to the double curve of their grinning mouths to the long scratches on their elongated bodies. They don’t seem ghostlike now, but vividly real. Alone among all whale species, beluga can tilt and nod their heads, and as they pass they turn their faces to me with grins that seem to say, “Man, you are a freaky-looking whatever-it-is.”

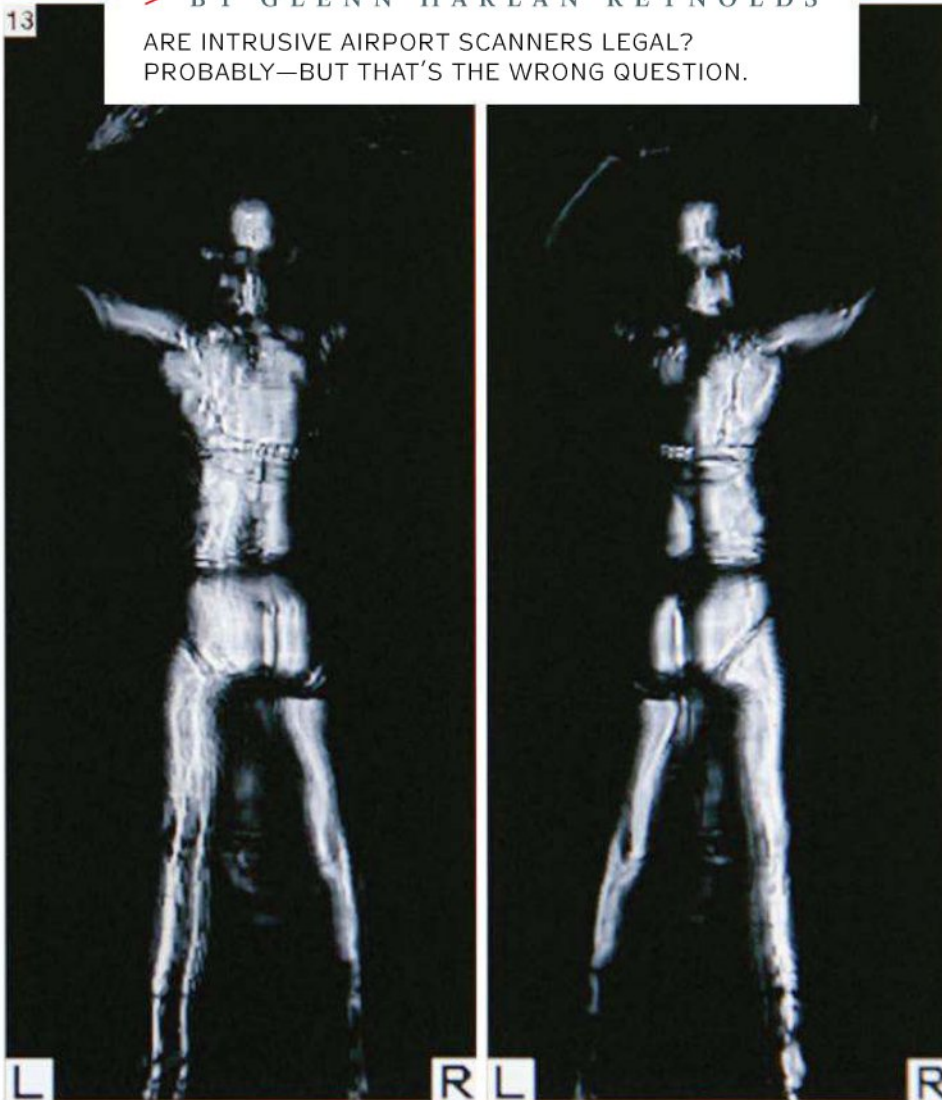
The water is giving me an ice-cream headache, but I don’t mind now that there’s so much to see. Gradually, my fingers begin to throb and ache from the cold. Though I’m shaking, I try to remain as still as possible to keep water from seeping into my suit. From time to time I can faintly hear the whales’ clicks and whistles. The fact that I’m chilled to the core does nothing to diminish the unworldly euphoria of the moment.

I can’t stay much longer; this cold bay is not my world. But I’ll hang on as long as I can, floating in the greenish glow, waiting for more of these strange creatures to make their way past. **PM**

The Security We Want

> BY GLENN HARLAN REYNOLDS

ARE INTRUSIVE AIRPORT SCANNERS LEGAL? PROBABLY—BUT THAT'S THE WRONG QUESTION.



The Transportation Security Administration uses two types of advanced imaging technology: millimeter-wave (demonstrated in the photos at left) and backscatter X-ray.

fact is that an American's right not to be searched—even, or perhaps I should say especially, when he's not suspected of a crime—is pretty limited. So-called administrative searches don't require any suspicion of wrongdoing, and they are allowed as long as they are "reasonable" and follow approved procedures.

What's reasonable? Well, to arrive at that conclusion, courts weigh the seriousness of the harm the searches are supposed to prevent and the likelihood that the searches will help against the degree of intrusion. (For more on these issues, see "Surviving the Digital Swarm," page 54.) Courts have consistently upheld traditional airport security—involving metal detectors and followup pat-downs for weapons—as meeting this test. Weighing the potential deaths of hundreds or thousands, plus the destruction of millions of dollars of property, against a few minutes of inconvenience, the courts have found every procedure they've looked at to be constitutional.

Despite the recent spike in outrage, the new methods of searching passengers aren't entirely new. Writing in the *Journal of Air Law and Commerce* in 2008, analyst Julie Solomon argued that the highly revealing screening techniques probably meet the legal requirements for administrative searches. The full-body scan (so long as you believe the TSA's privacy assurances) is not terribly intrusive, and the groper-style pat-downs are only a backup. Solomon also thinks that the approach is more reliable than previous security measures.

On the other hand, commentator Sara Kornblatt suggested in the *Loyola of Los Angeles Law Review* that the

W

ITH ALL THE ANGER AND CONFUSION THAT erupted in the fall regarding the TSA's use of enhanced search techniques—backscatter X-rays and millimeter-wave imaging devices that were derided as "porn machines," plus highly intrusive pat-downs—a lot of people started asking me if this sort of thing is legal or constitutional. That's understandable, since I'm a law professor who writes a lot about technology. But the real question isn't the law: It's what kind of security do we want? And the answer will raise issues that are going to persist a lot longer than controversy over any particular airport technology or procedure.

The short answer to the "Is it legal?" question is almost certainly yes. Despite the impression you get from some critics of the legal system, the




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THINKING AHEAD /// THE SECURITY WE WANT

searches should not be allowed, at least as a primary line of defense, because of privacy concerns—both at airports and everywhere else the machines may end up.

Who's right? I'm inclined to think that the federal courts will uphold these searches, accepting authorities' representations on privacy and also relying on the premise that those who are offended by the searches can simply forgo air travel. That's what they've always done, and they show no sign of changing their approach now.

But what courts think isn't what really matters here. What matters is what *you* think. Ultimately, the amount and kind of security we'll have at airports, and everywhere else, is the amount and kind that Americans are willing to put up with. So instead of talking about what the courts will allow, it's time to think about what Americans want.

Today's airport security is widely regarded as a waste of time—the TSA has never caught a terrorist, that we know of—and many regard it as what security expert Bruce Schneier calls security theater: something aimed at giving the appearance of safety, as opposed to its reality.

Even if that's a bit too harsh, or simplistic, it's clear that American security policy is aimed at keeping objects off planes—and that this is just one possible approach. For the Israelis, on the other hand, the focus isn't on things but on potentially dangerous people. Israeli Arabs often breeze through security, while Americans with odd stamps on their passports—as globe-hopping correspondent Michael Totten recently noted—face extensive questioning. The Israelis focus on the person, looking for signs of nervousness, stories that don't hang together and other evidence of nefarious intent. This makes sense. Ultimately, it's people, not objects, who pose the danger.

With our legalistic culture, Americans don't like the Israeli approach because we fear it may produce profil-

ing. (Indeed, in the Israeli system, profiling isn't a bug but a feature.) But we Americans might decide we want to be more like the Israelis anyway. Or we might decide that the old security approach was good enough. Or we might even decide to *really* think outside of the box and follow Archie Bunker's proposal from the first wave of airline hijackings back in the early '70s: Hand every passenger a gun as they board, so that any armed terrorists will be outnumbered.

Well, probably not. But for too long, Americans have let the security folks make all the security decisions, even though those decisions require tradeoffs that affect us all. In November, when consternation over the new searches started to boil, economist Steven Horwitz argued forcefully that the stepped-up air security might cost more lives than it could save, by encouraging large numbers of Americans to drive when they otherwise would have flown. Given that air travel statistically is much safer than driving, he may have a point.

Remember, the only time a terrorist attack on a U.S. airliner has been defeated (as opposed to fizzling when a shoe bomb failed to detonate) was on Flight 93. That's when the passengers, armed with information from the other hijackings that day, took action themselves. Security has always been about everyone, not just the professionals, because where terrorism is concerned, everyone is on the front line. Anyone might be a first responder, by virtue of being where an attack happens. So it's time for the public to weigh in and for authorities to listen.

To fight terrorism, we need a populace that is informed, motivated, vigilant and prepared, not one that is seething and feeling powerless and resentful. Yet our current security approach seems almost designed to produce the latter. Can that be right?

Terrorism is a widely dispersed threat, hard to pin down, constantly evolving in approach. It can only be countered by something else that's widely dispersed, capable of quick change and dedicated to success. Luckily, we have something like that. It's called democracy. Let's use it. **PM**



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HOW IT WORKS

TOP-FUEL DRAGSTER

> BY LARRY WEBSTER

> ILLUSTRATION BY AXEL DE ROY

THE RACE

On March 13, 2010, in Gainesville, Fla., Kalitta driver David Grubnic set a top speed record on the 1000-foot track. Here's a breakdown.

0.00 sec



0 ft 00.00 mph

After a burnout to clean and scuff the tires, Grubnic hits the gas at the green light, instantly accelerating at over 4 g's.

0.50 sec



10.27 ft 73.89 mph

The motor screams at its 8300 rpm redline, and the tires buckle under the load of getting the 2300-pound dragster moving.

1.00 sec



51.94 ft 113.82 mph

To reduce power and the acceleration of the drive-shaft and tires, the ignition advance is retarded from 56 degrees to 27—a strategy to keep the tires gripping the track surface instead of spinning.

1.50 sec



125.09 ft 162.45 mph

The ignition timing is advanced back to the maximum value. The clutch's throw-out bearing has moved through three of its five stages, increasing the pressure on the discs.

N

o other ground vehicle can out-accelerate a top-fuel dragster. The fastest class in the National Hot Rod Association (NHRA) drag-racing series, these cars can rocket to 300 mph in less than 4 seconds. That seemingly physics-defying performance is why Jim Oberhofer, the VP of operations at Kalitta Motorsports, calls top-fuelers violence on wheels. Add expensive too. One run down the strip consumes fuel, bearings, valve springs and other parts to the tune of \$5800. Stand nearby when a "rail" car lights off and you can feel the ground shake. It's unnerving. These machines are so fast—topping 330 mph—that the quarter-mile track (1320 feet) was shortened to 1000 feet after Scott Kalitta was killed in 2008 when his car exploded at the finish and crashed into the catch fence. That tragedy did not deter the Kalitta crew. As the team prepares for the 2011 season, which starts Feb. 24, we peel off its top-fueler's bodywork to learn the secrets of its insane acceleration.

FUEL

1

Top-fuelers burn a mixture that's 90 percent nitromethane and 10 percent alcohol. Interestingly, a gallon of nitromethane, which costs \$58, has less energy content than gasoline (14 kilowatt-hours versus 34). But nitro is an oxygen-rich compound that requires less air to burn, so the engine can consume more of it, thereby producing greater power. The 58 nozzles in the intake tract are always open, dumping about 5 gallons of fuel in a 4-second run. That kind of flow requires a firehose-like fuel line.

CLUTCH

2

A five-disc dry clutch is the only link between the engine and the locked rear end—there's no transmission. "The clutch is the lifeline of the car," Oberhofer says, because it regulates wheelspin by gradually engaging and slipping as the car moves down the track. A hydraulically motivated throw-out bearing operates off a simple timer (computer controls are illegal). The clutch is tuned according to track conditions. If it engages too quickly, the tires will spin, but if it's too lazy, the car won't accelerate as fast as possible. The discs get so hot that at least two of them are welded together by the run's end.

TIRES

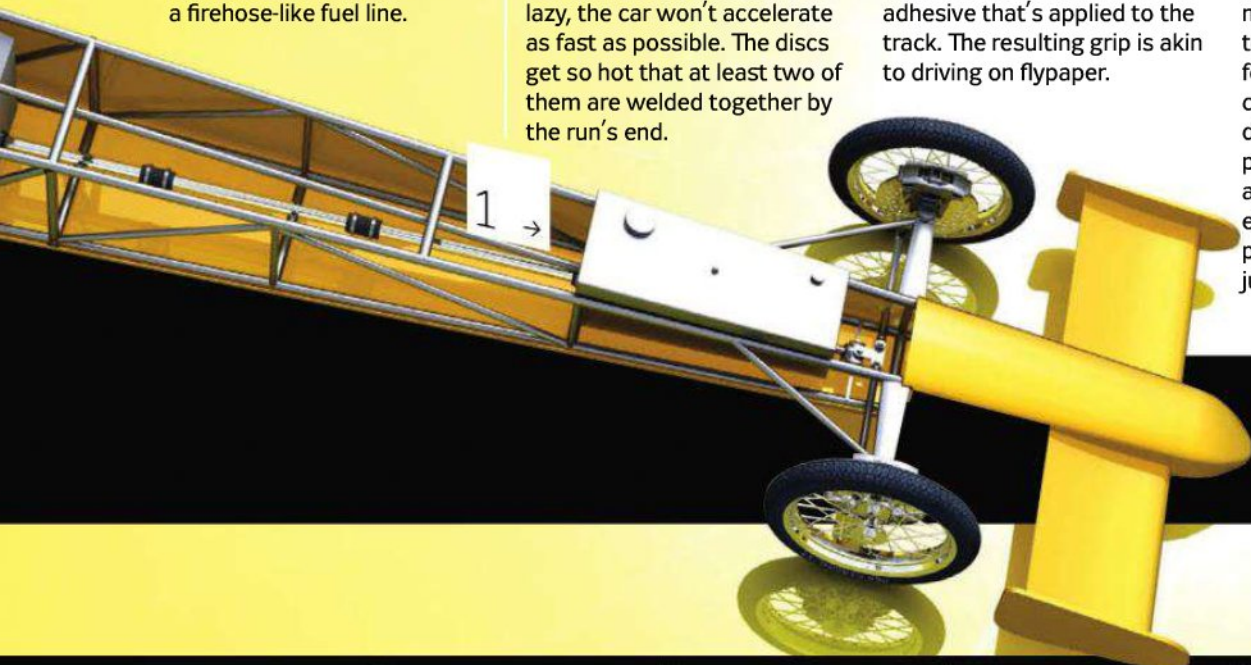
3

Specially constructed Goodyears have the intimidating task of transferring all that rotational energy to forward speed. The bias-ply tires also dramatically change diameter over a run, which has the effect of altering the overall gearing. At the start, the 36-inch-diameter tires squat as the sidewalls wrap around the wheels' bead locks. With increasing vehicle speed, the tires expand to a final diameter of 44 inches. The special blend of tread rubber is designed to adhere to the adhesive that's applied to the track. The resulting grip is akin to driving on flypaper.

ENGINE

4

A top-fueler's exact horsepower is a mystery—there isn't a dynamometer that can handle one. Current estimates are in the 8000 neighborhood, and, no, we didn't mistakenly add a zero on the end. The basic layout is very similar to the 1964 Dodge Hemi 426 V8—16 pushrod-activated valves—but with two spark plugs for each cylinder and a total displacement of 500 cubic inches. The supercharger, which is just a belt-driven air pump that force-feeds the engine, is so massive that it takes 700 hp to run it. The extreme internal forces literally flatten the crankshaft bearings and destroy valve springs during a pass. So the engine is rebuilt after every run by a team of eight mechanics. They perform this harried rebuild in just 40 minutes.



2.00 sec



231.91 ft 213.09 mph

The fuel flow ramps to 95 gallons per minute. Aerodynamics increase tire traction so the throw-out bearing tightens its grip. The engine slightly bogs to 7200 rpm.

2.50 sec



379.86 ft 248.50 mph

In the time required to take a sip of coffee, Grubnic's car reaches 248 mph. Some of the clutch plates begin welding together, pulling the engine to its lowest rpm, 6500.

3.00 sec



566.16 ft 271.62 mph

Thanks to 5000 pounds of aero downforce, the tires have incredible traction, but wind resistance slows acceleration from the maximum 5 g's to about 4.

3.50 sec



783.62 ft 293.41 mph

Late in the run, many spark plugs have burned away, so the engine is dieseling, and some cylinders simply don't fire. "This is the engine's toughest zone," Oberhofer says.

3.83 sec



1000 ft 321.58 mph

The mechanical abuse finally ends as the dragster clears nearly 500 feet per second. Next, the driver pulls the chute and the crew then feverishly prepares for the next run.



ILLUSTRATION BY MARK GONYEA

BY GLENN DERENE AND SETH PORGES

PHOTOGRAPHS BY
PHILLIP TOLEDANO

SURVIVING THE DIGITAL

SWARM



YOUR PRIVACY IS A CLOUD OF DATA SCATTERED ON SERVERS THAT ARE BEYOND YOUR CONTROL. YOUR DIGITAL PROFILE IS REGULARLY BOUGHT AND SOLD WITHOUT YOUR PERMISSION. **THE GOVERNMENT CAN TRACK YOU BY GPS WITHOUT A WARRANT.** SURE, IT'S ALL PART OF LIFE IN THE DIGITAL AGE. BUT IT'S OKAY TO BE ANNOYED ABOUT THE EXTENT OF IT. AND IT'S DEFINITELY OKAY TO FIGHT BACK.

THREAT LEVEL

IRRITATING

VICTIMS: ANYONE WHO USES TECHNOLOGY
DAMAGE: A SLOW BUT MANAGEABLE LEAK OF PERSONAL INFORMATION, BEHAVIOR AND GEOGRAPHIC LOCATION

PUBLIC CAMERAS

Legally, public spaces are fair game for taking photographs. But these days the sheer number and sophistication of public cameras is creating an environment of constant surveillance—especially in cities. A 2006 survey by the New York Civil Liberties Union (NYCLU) found more than 4000 cameras in Lower Manhattan alone. “Since then, the number has grown exponentially,” NYCLU spokeswoman Jennifer Carnig says. “There are now too many to count.” Add to that Google’s roving Street View cars, which routinely capture images of houses and pedestrians (sometimes in compromising states), and a growing number of license-plate-reading cameras installed at tollbooths, in police cars and at intersections, which law enforcement uses to run checks on thousands of unsuspecting drivers each day. “We’re now seeing proposals in states to allow police to upload, record and build [car-tracking] databases,” says Peter Eckersley, a staff technologist at the Electronic Frontier Foundation.

FIGHT BACK *There’s really nothing you can do about the proliferation of public cameras, but red-light cameras are another story. Many radar detectors now come loaded with databases of known locations. And if*

you don't want your house (or anything else personal) on Google Street View, load the offending image and click the Report a Problem link on the bottom left corner. It will bring up removal instructions.

LOCATION-BASED SERVICES

By using a phone's GPS chip to broadcast your location—and by making it easy to find friends who have done the same—“geosocial” networking services such as Foursquare, Facebook Places and Gowalla are transforming the way people interact in the real world. And while a log of your movements is gold to marketers, broadcasting this information can potentially have more dangerous consequences (see “Location-Based Creeps”). Security researchers have shown that it's possible to hijack info from geosocial

services that was meant to be shared only with friends, and many users don't bother with privacy controls at all. “It amazes me that people post their phone number and location,” says Kevin Haley, director of Symantec Security Response. “You're giving access to yourself to anyone in the world.”

FIGHT BACK Use location-based services to post where you've been, not where you are. “The present tense makes you vulnerable,” says Efstratios Gavvas, a computer scientist at the Polytechnic Institute of New York University. Set the privacy settings in Facebook Places to block other people from posting your location. And be wary of linking your Foursquare account to Facebook or Twitter—that will reveal your location to the world.

SUPERCOOKIES

Web cookies aren't all bad—they allow online merchants to store items in virtual shopping carts,

and keep you logged in to Web-based e-mail services—but they can also be used by marketers to log your online activity. “Some cookies can track you across multiple sites,” says Samy Kamkar, a Los Angeles-based programmer. The conventional best practice has always been to turn off third-party cookies in your browser's privacy settings—this keeps outside advertisers from tracking you, yet still allows websites to work properly. Lately, however, a new privacy threat has gained attention. Cookies are also stored by Adobe's ubiquitous Flash software, which has its own separate privacy settings. The scary part: Blocking cookies in most browsers has no effect on Flash cookies, and savvy marketers have exploited this loophole to open up a whole new avenue of tracking, even using Flash cookies to reinstall deleted browser cookies. In an effort to draw attention to the issue, Kamkar has created an “evercookie” that constantly repopulates itself, even across browsers, every time you try to delete it. “I think people need to understand every possible location that cookies can be stored,” Kamkar says, “then understand how to prevent them.”

FIGHT BACK To control Flash cookies, right-click on any Web-based Flash content (such as a YouTube video), and select Global Settings to bring up the Adobe Settings Manager. To clear the cookies, go to the Website Storage Settings panel.

SOCIAL-NETWORK DATA MINING

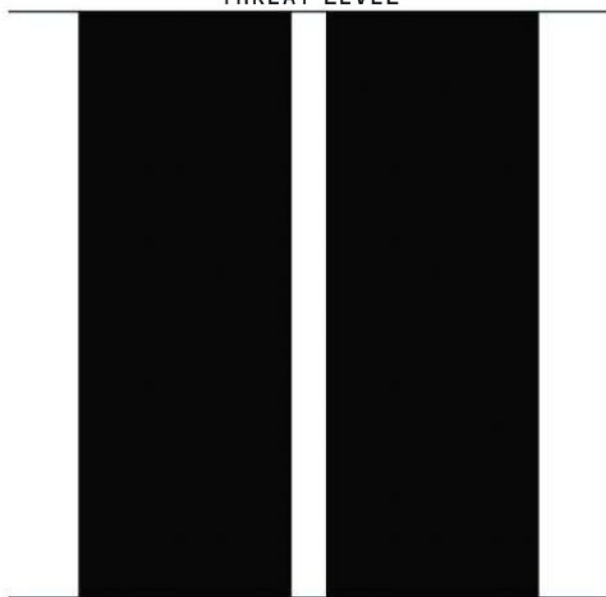
While social networking sites are designed to help users share information with friends and family, it can be just as easy for unwelcome visitors to eavesdrop. Facebook has come under fire for allowing third-party app developers to collect and sell information about users. Last year, a company called Rapleaf was exposed for using Facebook data to create and sell profiles on individual users. But the concerns are hardly limited to one service. A 2009 survey of 45 social networking sites by the University of Cambridge found that privacy policies were routinely difficult to understand, and there were no industry standards for privacy protection. (Google and Facebook have since revised their policies to address this concern.) Yet experts we spoke with say that these sites pay lip service to privacy but routinely compromise the data of their users through neglect or for profit. “Google, Facebook, Myspace and others have gone beyond connecting people—they're exposing them,” says Babak Pasdar of the security firm Bat Blue.

FIGHT BACK Be wary of what you post on social networking sites. “Don't put your age and household info out there—these are key building blocks of a profile,” says Michael Fertik, CEO of Reputation-Defender. It's worth the effort to dive deep into the privacy controls of your social networking sites—the default settings are a free-for-all—and delete Facebook apps you don't use anymore.



LOCATION-BASED CREEPS Social-media expert Carri Bugbee was at a restaurant with friends when two strangers called to threaten her after pulling Bugbee's location from the geosocial networking service Foursquare. “They were trying to scare me,” she says, “and it worked.” Fortunately, the harassment lasted just one night.

THREAT LEVEL



INFURIATING

VICTIMS: FREQUENT FLIERS, BIG-BUSINESS CUSTOMERS, MOBILE WEB SURFERS

DAMAGE: DEEPLY PERSONAL AND POTENTIALLY FINANCIAL, YET ULTIMATELY REPAIRABLE

WHOLE-BODY SCANNERS

Now in use in more than 65 U.S. airports, whole-body imagers use either millimeter-wave or backscatter X-ray technology to see weapons that might be hidden beneath clothing. The uproar over these machines peaked last holiday travel season as millions of travelers were exposed to the scanners for the first time (see "The Security We Want," page 48). Hundreds of travelers logged complaints with the Transportation Security Administration, and the Electronic Privacy Information Center (EPIC) filed a lawsuit against the Department of Homeland Security to suspend deployment of these scanners in airports. Some privacy advocates claim the machines may even run afoul of child pornography laws.

FIGHT BACK *You have the right to opt out of a body scan, but if you do, be prepared for an "enhanced" pat-down that, to some, may be even more intrusive. Until the law changes, expect a lot of travelers to drive or take the train whenever possible.*

STOLEN DATABASES

According to the Privacy Rights Clearinghouse (PRC), the 2000-plus major data breaches made public since 2005 have exposed more than 500 million customer records to potential cybercriminals. (The total number of affected individuals is difficult to determine, since many people may have been victims of more than one breach.) Customer database breaches can occur for any number of reasons, from a sophisticated attack on a credit card company's server, to a laptop lost by a health insurance employee. In other words: Your privacy may be threatened by somebody else's ineptitude.

FIGHT BACK *These breaches are often out of your control, but you can still minimize the damage. If your data has been compromised, report the incident to a credit rating agency. And if a company wants to use your social security number to identify you, ask them for an alternate ID number—it'll be much less damaging if stolen.*

CELLPHONE HACKING

Most security experts agree that the next big wave of cyberthreats will be aimed at mobile phones, which have the double vulnerability of being location-aware and storing plenty of personal data. Security researchers have



LITTLE DRIVE, BIG BREACH *During testimony in 2006, former Secretary of Veterans Affairs Jim Nicholson showed a hard drive similar to one that was lost when a VA analyst's laptop was stolen that May. The laptop and drive contained personal data, including social security numbers, for more than 26 million veterans. Luckily, the laptop was recovered before much damage occurred.*



made a sport of finding potential security holes in Apple's iOS and Google's Android mobile operating systems, and there are already numerous apps that can track a phone's physical location or, as is the case with the M-Spy and IP Webcam apps, remotely turn on an Android phone's microphone or built-in video camera. "With the expanding use of mobile phones, we're only seeing the beginning of the types of privacy breaches possible," says Symantec's Haley.

FIGHT BACK *If you're using Android or a jailbroken iPhone, treat app downloads like e-mail attachments from strangers and limit yourself to apps from developers you trust. If you think your phone may have been compromised, a factory reset (usually found in a smartphone's general or privacy settings) will wipe away any malware.*

WI-FI HIJACKING

Public Wi-Fi hotspots are often set up with no security precisely so anybody can log on. But this convenience comes at a price: Open networks make it easy for hackers to perform a trick called session hijacking, wherein

one user on a network grabs a browser session from another user after he's logged into a supposedly secure site, such as a social network, an online bank or a store. The attacker then has complete access to the victim's account, and can change the password to lock the victim out. Recently, a programmer who goes by the name of Codebutler released a Firefox plug-in called Firesheep, which makes it possible to pull a session hijack with just a single click.

FIGHT BACK *Think twice about what you do when logged on to a public hotspot—a determined hacker can intercept anything you send. And only use networks you trust. Even if one has a legit-sounding name like "AT&T," it could still be a trap. "You may think you're signing up for the coffee shop's Wi-Fi when a hacker has actually set up his own," says Kevin Haley, director of Symantec Security Response.*

THREAT LEVEL



DEVASTATING

VICTIMS: HARASSED EX-SPOUSES, GOVERNMENT SUSPECTS, RANDOM TARGETS, FUTURE HOMEOWNERS
DAMAGE: PSYCHOLOGICAL AND PHYSICAL THREATS, OPPRESSIVE ORWELLIAN INTRUSION

GPS CAR TRACKING

Low-cost GPS devices for tracking kids or pets may be marketed for innocent purposes, but they can also be used to sinister effect. Last November, Christina Crosby of Jacksonville, Fla., found one of these devices attached to her car after her estranged husband started randomly showing up at places she went. It is illegal for citizens to secretly track each other via GPS,

but the law is not so clear when it comes to the government. And sometimes the law-enforcement GPS dragnet is cast uncomfortably wide (see "Feds in My Undercarriage"). Last summer, the U.S. Court of Appeals for the Ninth Circuit ruled that law-enforcement agencies have the right to attach GPS trackers to your vehicle without a warrant—even in your own driveway.

FIGHT BACK *If you have reason to believe someone is tracking your vehicle, take it to a mechanic for a look-see—most found trackers pop up during routine inspections. The best place to look: under the car, near the rear wheels.*

INTERNET TROLLS

Allison Stokke wasn't looking for Internet fame, but it sure found her. In May 2007, a picture of the high-school pole-vaulter from Newport Beach, Calif., was posted on a track-and-field enthusiast site. While there was nothing unusual about the



photo, the image of the pretty athlete inexplicably went viral. Within weeks, she was dealing with unofficial fan pages, fake Facebook profiles and a deluge of lewd messages and phone calls. These days, the Internet can turn almost anybody into an object of mass obsession, often for no real reason. One center of gravity for those obsessions is the anarchic anonymous Internet posting site *4chan.org*. Started in 2003 by a 15-year-old from New York City, it has morphed into a pure expression of Internet id—an endless stream of geek slang, pornographic pictures and juvenile jokes that can motivate its users (known derisively as trolls) to gang up on almost anyone. Targets have ranged from the vaguely political (a hack of Sarah Palin's web-mail account) to the weirdly sentimental (a flood of birthday cards sent to a 90-year-old World War II veteran), to the downright vindictive (a barrage of harassment directed at an 11-year-old Florida girl). The site's tech-savvy trolls have been known to find and distribute its victims' personal information, and the attacks are as random as the site itself.

FIGHT BACK *Protecting yourself from Internet trolls is like a farmer attempting to fend off locusts. Because there is usually no central organization behind the behavior, it can be impossible to deal with head on. Worse: Trying to fight back could further provoke the perpetrators. If you are the victim of an attack, keep in mind that most reputable sites such as Facebook, Myspace or YouTube respond to take-down requests for any material that is lewd, slanderous or threatening.*

CYBERSTALKING

In 2004, Alexis Moore's ex-boyfriend hacked into her online accounts, shut off her utilities and cellphone and then emptied her bank account. "It took three long, frustrating years to fix everything," Moore, the founder and president of the victims' support group Survivors in Action, says. As privacy invasions go, stalking is the most personal and intensely frightening. And as technology has improved, stalking perps have become more sophisticated. Keylogging software makes it possible to remotely monitor every word typed on a PC, webcam hijacking software can secretly capture video every time someone moves in front of their computer, and cellphone trackers can transmit the location

of victims in real time. "The technology is outpacing law enforcement's capability to keep up," says Michele Archer of Safe Horizon, a domestic violence support center. "For many victims, it's very scary. They tell us they feel like they're being watched all the time."

FIGHT BACK *If you or someone you know is being harassed, contact a local victims' services group, says Michelle Garcia of the National Center for Victims of Crime, which has resources on its website, ncvc.org. Garcia also recommends that victims document everything. "Let all of your calls go to voicemail so that they are recorded," she says. "Also print out instant messages and create a log of the date, time and place of each incident."*

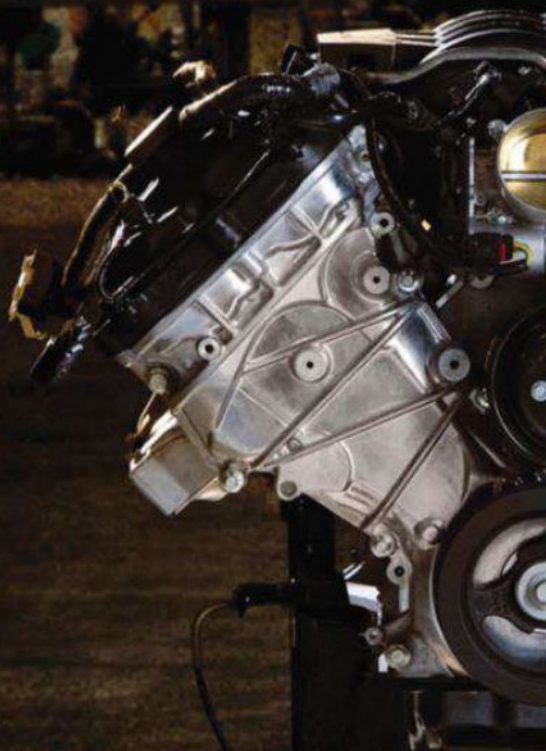
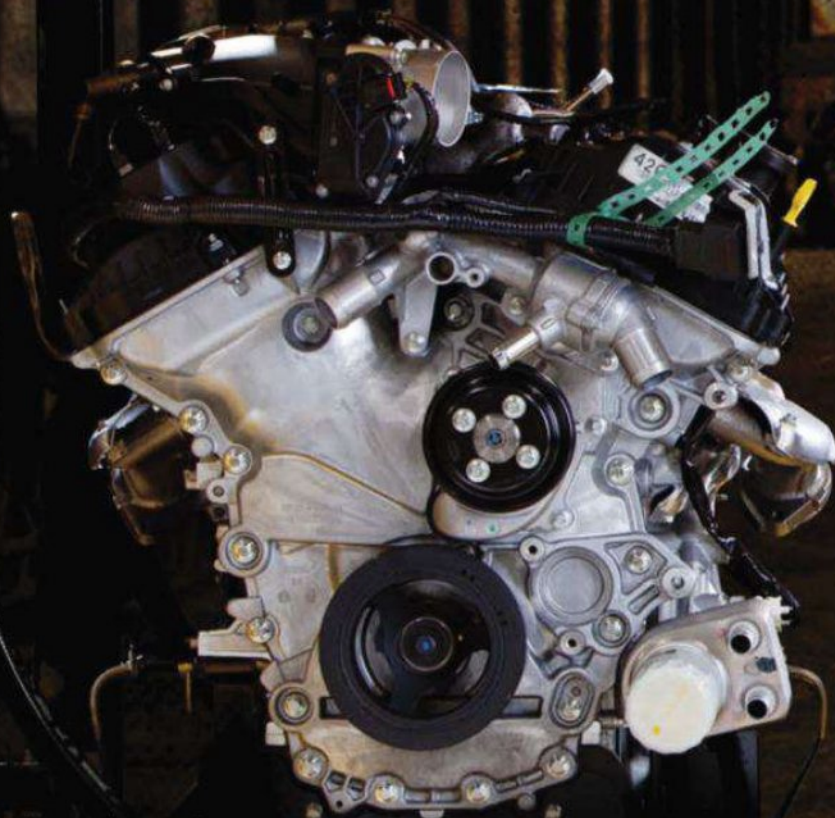
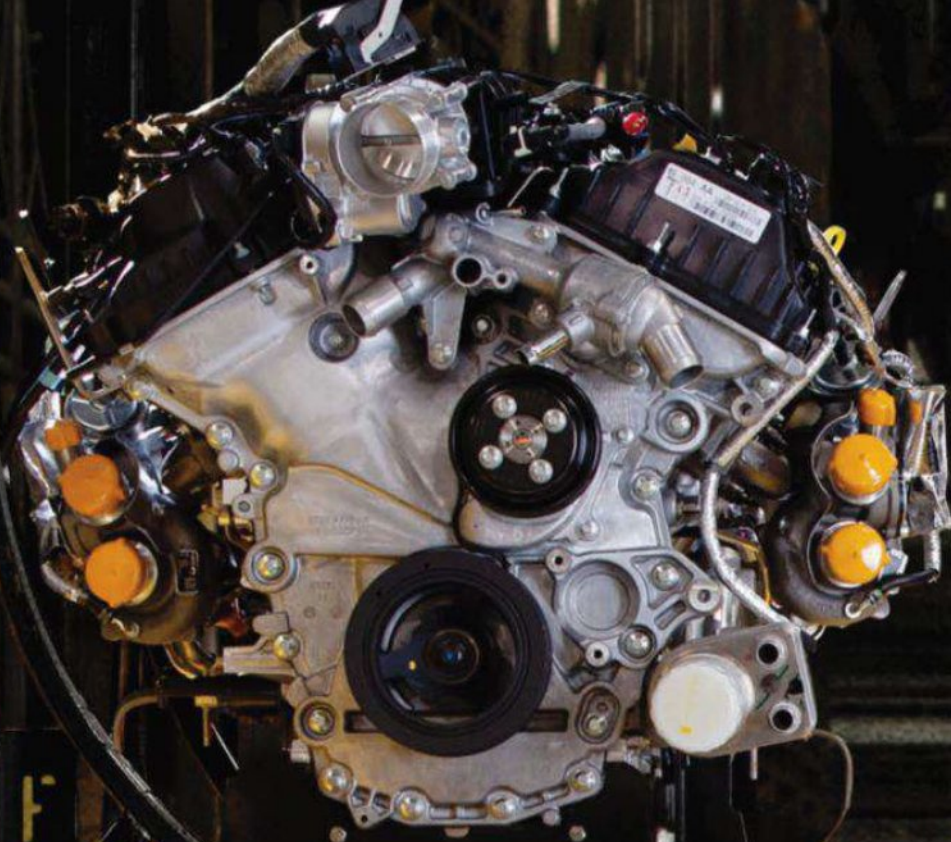
THE AWARE HOME

The hot new Microsoft Kinect is a revolutionary camera-based gaming accessory that recognizes the movements of players' bodies. It also has the potential to become a sophisticated digital marketing tool. Last November, Microsoft executive Dennis Durkin commented to investors that the Kinect could conceivably be used to track the behavior of people watching television. "In the future, [we'll be able to] get better data about how many people are in a room when a [football] game is being played," he said. "How are those people engaged with the game? Are they wearing Seahawks jerseys or are they wearing Giants jerseys?" Likewise, smart-grid technology already in use by some major utilities allows for real-time monitoring of electric meters, with an eye toward eventually embedding intelligence in every appliance in the house, including thermostats, washers, dryers and refrigerators. The aim is to promote efficiency, but the side effect may be to turn your home into a highly precise behavior-monitoring system.

FIGHT BACK *Although none of this stuff is currently being used for a Big Brother agenda, consumers should keep tabs on the evolution of any technology that watches you in your home. Advocacy groups are demanding privacy protections be built into aware devices and smart-grid infrastructure. The data collected by these devices could eventually be used by everyone from nanny-state public officials to criminals cruising for empty homes. PM*



FEDS IN MY UNDERCARRIAGE *Last October, Yasir Afifi, a college student and son of an Islamic-American community leader, discovered a GPS tracking device on his car during an oil change. The California resident's friend posted pictures of it on the Internet, and two days later, FBI agents showed up at Afifi's door to reclaim their device. Afifi's lawyer says he has not been charged with any crime.*

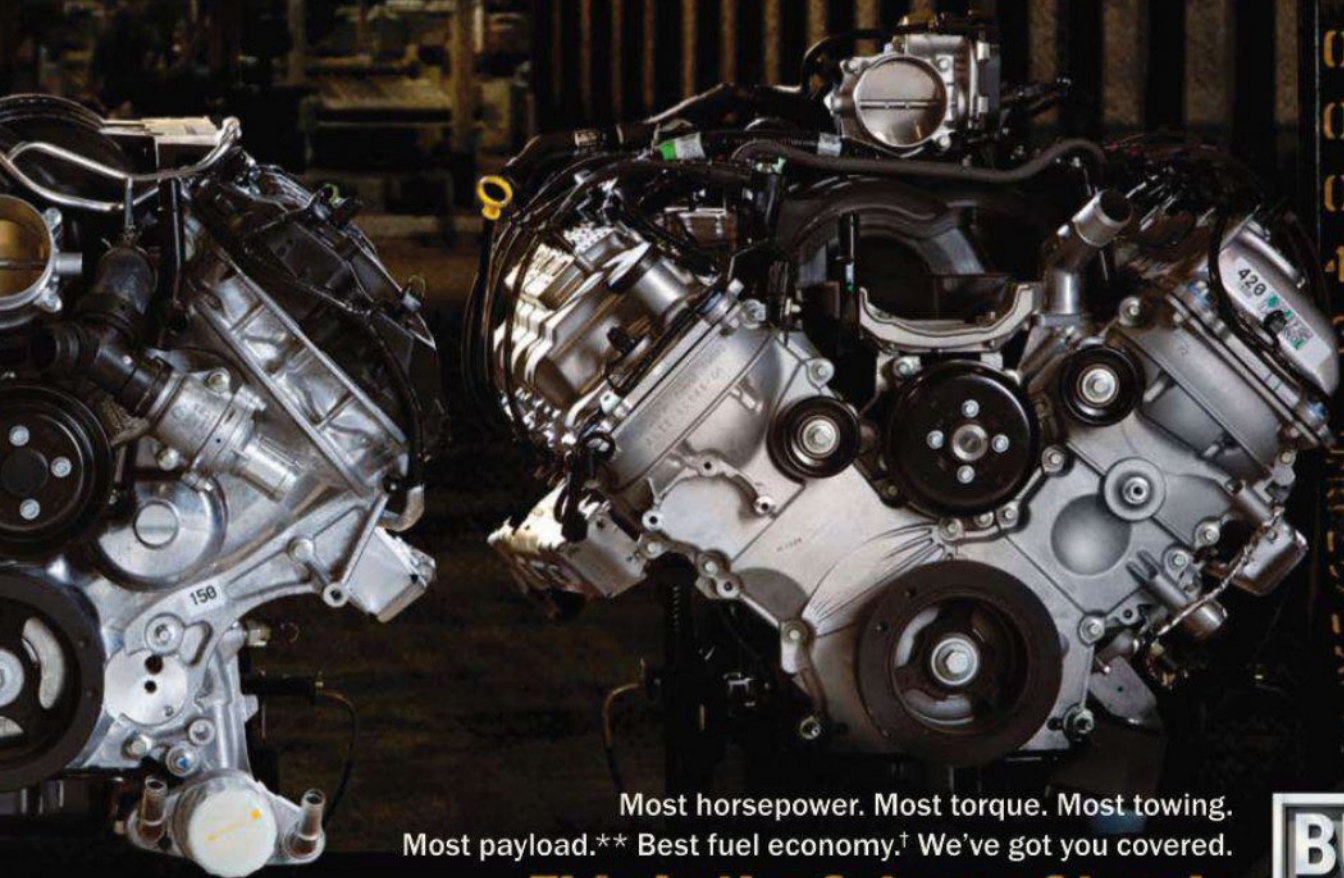


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BY THE EDITORS

ONCE WAS ENOUGH

20 DIY MISTAKES WE'VE MADE SO YOU DON'T HAVE TO



1: DEEP-WATER DRILLING

I used a 3-inch drywall screw to hang a heavy, framed painting in my bedroom, because the extra length provides more load-bearing strength, right? It held the frame fine, but two months later, the living-room ceiling collapsed. Turns out the screw had punctured a water pipe, creating a slow, insidious leak.

Lesson Learned: Use a hollow-wall anchor, not a drywall screw, which can plunge deep enough to do real damage.

2: MICROBUS FLAMMÉ

While rebuilding the carb in my 1962 VW Microbus, I forgot to replace the float-bowl drain plug. It was late, I was tired, and gas leaked. I fired up the engine, I mean, I really *fired it up*: The inferno fried all of the wiring, but I had two 20-pound CO₂ fire extinguishers on hand, so at least I didn't burn down the garage.

Lesson Learned: Keep close track of parts so you can put all of them back in their rightful place. Magnetic parts trays will run you \$10 to \$20 apiece, but an old frying pan works just fine, too.



3: VAMOOSE, VARMIN'T

In animal behavior, "philopatric" describes a critter that knows how to find its way home. Like a woodchuck, for instance. I trapped one in my yard, deposited it in a park a half-mile away—and then repeated the process four times. I spoke with a wildlife official and discovered three things.

Lesson Learned: (1) The meaning of the word *philopatric*. (2) It's illegal to relocate woodchucks in many states (though not in mine), so check the law before you move one. (3) A half-mile is a laughably short distance for woodchuck relocation. For me, 5 miles did the trick.

4: D'OH!

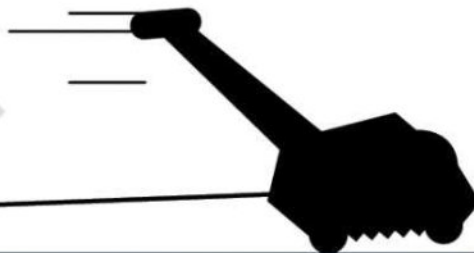
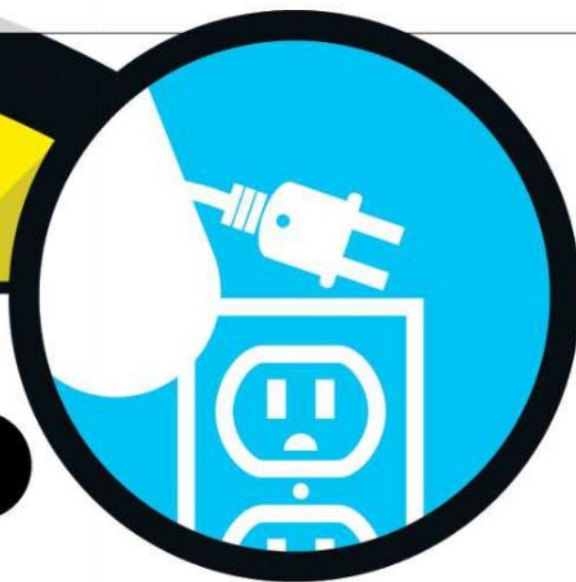
I FUMBLER A SHEET OF PLYWOOD AND CRUSHED MY BIG TOE.

Lesson Learned: Your average 1/2-inch, 4 x 8 piece of plywood weighs 50 pounds. Get a grip on it by using a tight-ened C-clamp as a handle. Oh, and for good measure, invest in a pair of steel-toe boots. Safety first!

5: WHAT A TOOL

I rolled the drum floor sander into the room, plugged it in—and it took off like a crazed robot. I gave chase as it bashed a hole in the wall and raced into the next room.

Lesson Learned: (1) Make sure the machine is switched off before you plug it in. (2) If you forget the first lesson, never chase a runaway floor sander: Instead, pull the plug.



6: CODE RED

Before driving a single nail to build my wood deck, I had the plans approved by the building department. I was proud of the design, which featured horizontal rail spindles—a code violation, as I would discover. After the job was completed, an inspector visited and described a scenario in which a child might climb the spindles as if they were a ladder and tumble to the ground.

Lesson Learned: Read codes carefully—meeting them is the homeowner's responsibility, and just because a plan is approved, it doesn't mean it meets code. Also, get the work inspected early, in case you need to change direction.

7: SOLO NO-NO

I had no trouble unhinging the heavy vintage front door of my house. But with the sun setting and the paint job still unfinished, rehanging the door was another story. I finally recruited a neighbor to steady it while I lined up the knuckles and replaced the hinge pins. Like many DIYers, I pride myself on being self-reliant, so I felt embarrassed, to say the least.

9: BIRD IN THE HAND

When joining a pair of 2 x 4s with a framing nailer, it's common practice even among experienced carpenters to squeeze the boards together with one hand while pulling the trigger with the other hand. Notice I said "common practice" and not "a good idea." Imagine my horror as I watched a colleague impale an index finger with a gas-fueled nailer, then marvel at the clean, pinprick entrance and exit punctures for about 1.5 seconds before the blood gushed forth like Texas tea from a freshly tapped well.

Lesson Learned: Keep the free hand clear of the muzzle and don't underestimate the distance an errant 3-inch nail can travel when fired from any nailer, either pneumatic or gas-fueled.

Lesson Learned: Overestimate every aspect of a job, including how long it'll take, and envision it to the finish. Remember: Removing heavy objects (doors, cabinets) is easier than replacing them.

8: CRINGE-WORTHY

Tugging on a car wheel when preparing to replace a flat tire is risky. It's unavoidable sometimes, like when a lug nut is rusted in place. But no jacked-up car should ever be considered secure. I learned this from a friend who now has two fewer fingers than he was born with.

Lesson Learned: When removing the wheel, hold your hands at 3 and 9 o'clock, not 6 and 12 o'clock.



10: CHILD'S PLAY

MY 1-YEAR-OLD DAUGHTER THINKS LATEX PAINT IS DELICIOUS!

Lesson Learned: Young children and interior painting don't mix.

11: THANKS FOR NOTHIN'

A friend once helped drain the oil out of my race car but forgot to replace the drain plug. I poured 12 quarts of synthetic oil (the stuff is about \$8 a quart) into the sump, started the engine and learned the true meaning of the word mess. That, and one other little thing.

Lesson Learned: NEVER TRUST A HELPER WHO WORKS FOR BEER.



12: KISSED OFF

A "granite kiss" sounds romantic, but it can inflict a lot of pain: It refers to a finger or hand being crushed between stones while building a rock wall. After getting a granite kiss (index finger), we called Kevin Gardner, author of the book by the same name.

Lesson Learned: "Gloves don't help," Gardner says. "They give a false sense of security." Roll a stone on the ground to find the center of gravity (the heavy side). Place the stone with the center of gravity snug. "Don't cradle your hand beneath it. You can manipulate stones from the top."





13: ROOKIE ERROR

I spent months restoring my beloved Norton and finally took it for a spin. Man, what a thrill! Afterward I drained the oil (metal shavings always foul the oil on a first run, so it's good to get them out), then ran inside to escape a downpour. On my next ride, I was about 10 miles from home when I smelled the tell-tale odor of burning metal. The engine seized.

Lesson Learned: I affix a big NO OIL sign if the pan is empty. D'oh.

14: GRASS 101

I love my new, ground-level wood deck, but I don't love the grass growing between the boards.

Lesson Learned: Nail landscape fabric over the soil beneath the deck *before* you build.

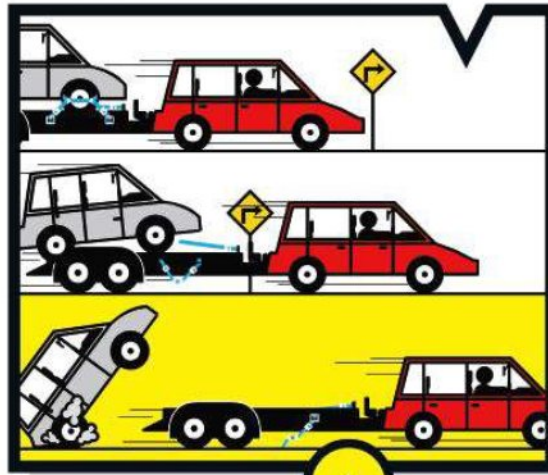
15: GLASS 101

Antique rippled-glass windows—like those in my living room—are lovely, but old panes scratch easily. I wish I'd known before I prepped to paint around mine.

Lesson Learned: When sanding a muntin, tape the pane's edges, and use a light touch!

After tying down my race car to the trailer with nylon ratchet straps, I was driving home on a smooth country road. After 45 minutes or so, I looked in the rearview and saw only the road behind me. I doubled back and, after 3 or 4 miles, found the car on the roadside, half on the shoulder, half in a ditch. The damage was already done, but...

Lesson Learned: When towing a car, pull over and retighten the tie downs about 20 miles after you first secure the vehicle. No matter how tightly you winch the straps, nylon stretches under stress, even on smooth roads.



17: HUE AND CRY

I was careful to cover every inch of the wall with the new paint, even though I took a couple of breaks. The new shade was darker, and the coverage looked good—until the paint dried, revealing a zebra pattern wherever I'd stopped and restarted.

Lesson Learned: Paint the whole wall without stopping. Repeat.

18: ALL WET

I was psyched to see how fast old paint came off my house with the pressure washer. I was going to



scrape and sand, but the power-tool option seemed great—until I saw I had not only cleaned the clapboards but also deeply scored them.

Lesson Learned: Test the pressure and nozzle size on a small portion of the surface. In most cases, the 15-degree nozzle works well for paint prep. The 0-degree beam I used is a weapon, not a tool.

19: GET ON TRACK

While installing a garden path in my backyard, I tried to roll a wheelbarrow full of crushed stones down four steps. On the second step, everything went wrong.

Lesson Learned: To avoid dumping your load, place a 2 x 10 down the center of the stairs, carefully set the wheel onto the board and ease the wheelbarrow down the track.

20: ATTIC ANTICS

While laying insulation in my attic, I slipped while balancing between a couple of joists and put my boot through the bedroom ceiling. I felt pretty foolish, but that didn't stop my neighbor from having a good laugh at my expense before giving me some advice.

Lesson Learned: "Just use a couple of plywood scraps as movable platforms," he said.





THE RESURRECTION OF XZ439

A FORMER MARINE TEST PILOT ENLISTS A VOLUNTEER WRENCH GANG TO GIVE NEW LIFE TO A RETIRED SEA HARRIER JUMP JET—AND IT RETURNS THE FAVOR.

THE OLD HARRIER IS A TEMPERAMENTAL BEAST, AND SOMETIMES IT refuses to fly. Today, Oct. 9, 2010, the fuel pump craps out, and the wrench gang sits around glumly, waiting for the spare part to arrive. The timing of the breakdown is demoralizing. Thousands of people have flocked to Culpeper Regional Airport in rural Virginia to witness the spectacle of Sea Harrier XZ439—the only operable aircraft of its type in civilian hands—thundering through the air, approaching its top speed of 730.25 mph. That's an impressive

BY MICHAEL KAPLAN

PHOTOGRAPHS BY TIM WRIGHT



Walking on Air:
Formerly a Royal Navy fighter, Sea Harrier XZ439 is now a star on the air-show circuit. Here, it hovers above Virginia's Culpeper Regional Airport on Oct. 10, 2010.

number for a 31-year-old decommissioned fighter. But the spectators ringing the tiny airstrip don't care about fast. They came to see the Harrier dance.

Owner Art Nalls made history at 13:57 hours on Nov. 10, 2007, by getting the reconditioned Harrier airborne, at St. Mary's County Regional Airport in Maryland; he was the first nonmilitary pilot to accomplish the feat. Nalls describes the aircraft as "a puppet without strings." With four directional nozzles pouring out 21,500 pounds of thrust, the 7-ton plane can take off and land vertically (hence the common name, jump jet), spin like an ice skater and hover and dart like a dragonfly. The roar of the Rolls-Royce Pegasus Mk. 106 engine adds to the sensory assault: One air-show announcer described the jet as "hovering on a cloud of noise." Says Nalls, 56, who first fell in love with the machine as a U.S. Marine Corps pilot, "Watching the Harrier is like watching a magic show."

But now the would-be star of the Culpeper Air Fest sits idly. Adding to the frustration is the fact that Nalls's pal from the Marines—Joe Anderson, 64, a pilot with 33 years' active duty and a wrench-gang member—was due to take the Harrier up, and he'd invited a dozen family members to watch.

A big man with ruddy cheeks and graying hair, Nalls slumps in a folding chair at the mouth of the hangar. He glances up at a formation of six biplanes. His gaze shifts to the Harrier. "Nobody is happy with this outcome," he says.

Sitting nearby are several of the Harrier's mechanics, each of whom has volunteered weekends for more than four years to work on the plane. They try to lighten the mood. Barrel-chested Rich Gill, 51, of Dameron, Md., cracks that his wife calls the plane "my big, gray mistress." Pete Weiskopf, 68, of Hollywood, Md., chimes in: "My wife wishes I had a mistress *instead* of the plane, so she could see more of me."

Nalls's wife, Pat Hatfield-Nalls, later confirms that the Harrier crew has experienced domestic strife. "I hear it from the guys: 'My wife is jealous I'm working all those hours on Art's plane,'" says Hatfield-Nalls, a Navy veteran who met Nalls in 1991. "Women say,



June 1970: The Harrier Debuts in PM POPULAR MECHANICS lauded the British jump jet—and trashed U.S. efforts to develop a similar plane. "The utter simplicity of the [British] aircraft makes one wonder what U.S. aeronautical experts could have been thinking with their Rube Goldberg arrangements."



Boneyard Beauty:

Art Nalls called mechanic Christian Vlahos just before buying the Harrier from a private owner in the U.K. "I like it—are you sure we can make it fly?" Nalls asked. Vlahos replied: "Yes—go for it."

Precious Cargo:

The jet parts, including the fuselage, were wrapped and delivered to the U.S. in cargo containers, then transported via flatbeds to a hangar at St. Mary's County Regional Airport, in Maryland.

Winging It:

The 3500-pound wing arrived on a separate flatbed. Here, Vlahos works to secure the wing to the fuselage. Just six bolts were used, but the supertight tolerance, or fit, made this a tedious, two-day task.

Secret Service:

Active-duty Harrier mechanics, such as Gunnery Sgt. Mike Pintha, from the Marine Corps Air Station Cherry Point, in North Carolina, pitched in on weekends—but had to be back on base by noon Sunday.



how could you put all your money into a plane.” (She says the project cost more than \$1 million.) “The answer is, I believe in dreams.”

One of the lead mechanics, Christian Vlahos, 34, admits to a different motivation. “The air-show sponsors send limos for us, put us up in nice hotels, take us out for dinner,” says Vlahos, whose forearms are covered with flame tattoos. “Plus, there’s nothing like the looks on people’s faces when they watch the Harrier fly.”

That’s what Vlahos aims to witness tomorrow. The plan is to replace the fuel pump tonight, fire up the jet in the morning and put Anderson at the controls. The audience will be smaller but the flight still thrilling and significant. The 2008 Culpeper Air Fest, XZ439’s debut show, drew more than 4000 spectators. The jet’s return this year was meant to be an *encore* and prove a point: The Harrier’s unique flight capabilities are supported by a notoriously complex mechanical system—and after all those weekends and late nights spent restoring that system to make XZ439 fly, the wrench gang will let nothing prevent them from getting the jet airborne again.

D

DEVELOPMENT OF THE JUMP jet began in the U.K. in 1957 with the advent of thrust vectoring, which provides the plane’s unique maneuverability. The British firm Hawker Siddeley made Harrier prototypes in the late 1950s and

early 1960s; the first production model came out in 1967 and began military service in July 1969. In various iterations featuring flight- and weapons-systems upgrades, the Harrier has seen combat for more than 40 years, primarily via the U.S. Marine Corps, the Royal Navy, the Royal Air Force and the Spanish Navy. But just 10 days after XZ439 was grounded at Culpeper, the British government announced the retirement of the 80 Harriers still in Royal Navy service. The move, part of a 7.5 percent defense-spending cut, marked the end of an era.

Art Nalls entered the U.S. Naval Academy, in Annapolis, Md., in 1972. He majored in aerospace engineering but also found time to indulge his quirky DIY sensibility, creating and riding what was then the world’s smallest bicycle (5 inches tall). After graduating from the Academy and earning his wings in Kingsville, Texas, he became a lieutenant colonel in the Marines, whose arsenal included a domestic Harrier variant, the AV-8B, by McDonnell Douglas. Nalls’s first carrier landing in a Harrier was on the deck of the USS *Iwo Jima*. “When you fly this airplane, you become almost fearfully passionate about it,” he says. “That’s how powerful it is.”

With its aggressive stance, sharp angles, flat-gray shell and flared inlets, the Harrier is unmistakably a war machine, and one with retro charm to boot. But what truly sets the Harrier apart is its blend of raw power and agility. A pilot experiences the euphoria of levitating the behemoth and then discovering it’s as nimble as a hummingbird.

But the Harrier can also be tetchy. On April 29, 1983, during a training flight near Richmond, Va., Nalls lost



Air Power:

Mechanics get ready to install two of the jet's four directional nozzles. Channeling up to 21,500 pounds of thrust, the ducts enable vertical or steep takeoffs and landings. By manipulating the angle of the ducts and the amount of thrust, the pilot

can also make the plane pirouette and even fly in reverse. Once, at a show in Michael Jackson's hometown of Gary, Ind., Nalls mimicked the pop star's iconic moonwalk dance move with the jet.

Disaster Averted:

XZ439 lies on the runway of the Naval Air Station Patuxent River, in Maryland, 15 miles from the Harrier's hangar, after an emergency landing by Nalls on Nov. 11, 2007.

A hydraulic failure crippled the landing gear, which collapsed seconds after Nalls had vertical-landed the plane. "The same scenario has proved fatal to several pilots," Nalls says. "The cockpit deforms, the ejection seat fires, and the pilot is decapitated." Nalls was unscathed—and had the presence of mind to call his wife, Pat, while sitting in the cockpit. "Honey, I'm okay," he said. She replied, "Okay from what?" Despite the accident, she urged Nalls to repair the plane and fly again.

engine power at 17,000 feet. "I was doing about 350 knots," he says. "That's plenty of energy to get the plane on the ground, but stopping it after that was another question entirely." He glided the plane onto a civilian airport runway. "It was 9000 feet long, and I stopped 50 feet short of the end," he says. The engine-out landing, a first for a Harrier pilot, earned Nalls the coveted Air Medal.

Nalls stopped flying Harri-

ers for the military in 1990, after he was diagnosed with an inner-ear ailment. "It devastated him," Hatfield-Nalls says. But it also gave him a new ambition—to become the first civilian to own and fly a Harrier.

CHRISTIAN VLAHOS HAS never met a plane he couldn't fix. A former Navy mechanic, he'd worked on F-14s and F/A-18s before returning to civilian

life in rural Maryland, near St. Mary's Airport. After retiring from the Marines in 1998, Nalls also settled in the area. He started a real estate company that essentially bankrolled Nalls Aviation—pursuing his passion for restoring antique military aircraft. In the early 2000s, he was looking for mechanics to maintain his planes. Vlahos was an obvious choice; he owns Chesapeake Aviation, an aircraft mainte-



Team Spirit:

A core group of a dozen mechanics—and a total of 32—have worked on the plane for more than four years, giving up weekends and nights on a volunteer basis. Asked how many hours he has logged on the project, mechanic Pete Weiskopf, 68, a former Navy officer, answers, “Unknown—5000-plus?” Cory Duffield, 27, says he relished the challenge. “So many people said there’s no way we could do it, so proving them wrong was a goal of ours. But the biggest thing of all was working to make Art’s dream come true. His top priority is taking care of his crew; that makes you want to work hard for him.”

PHOTOGRAPH BY LESLIE CUSTALOW (“DISASTER AVERTED”)

nance outfit at St. Mary’s.

“Art is charismatic, and he’d give you the shirt off his back,” Vlahos says. “It’s natural to feel loyal to him.”

In 2005, Nalls located Harrier XZ439 in Britain. He phoned Vlahos to say he was shipping it home, and Vlahos, in turn, called Gill. “Art bought a Harrier,” he said.

“What in the hell did he do that for?” Gill responded.

Gill’s incredulity was understandable: No Harrier had ever been restored to flying order by a civilian. But when XZ439 arrived stateside, in early 2006, word of the project spread. “Anyone who got wind of it wanted in,” Vlahos says.

Vlahos and Gill soon found themselves leading a crew of about a dozen regulars, plus others who occasionally joined in. Two mechanics focused on the ejection seat’s technology. A complicated assemblage, the seat can be a lifesaver—lofting the pilot into the air—or a killer: It has been known to deploy in rough landings, decapitating the pilot as he is thrust through the canopy.

Joe Anderson lost a member of his flight group in this way in the early 1970s. And on Nov. 11, 2007, during XZ439’s second flight with Nalls at the controls, he braced for the possibility that Nalls might suffer the same fate. A hydraulic failure 11 minutes after takeoff prevented deployment of the landing gear. For 30 minutes Nalls flew tight circles, using centrifugal force to extend the struts. Then he requested an emergency landing at Naval Air Station Patuxent River, 15 miles from St. Mary’s.

The wrench gang raced to Patuxent. Nalls hovered the plane above a landing pad. “My heart was in my throat,”

Vlahos says. “The ejection seat was armed, and Art hadn’t vertical-landed a Harrier in 16 years.” Seconds after Nalls set down the plane, the landing gear buckled (it had extended but not locked). The jet crashed to the ground. “My head jerked forward so hard, I thought my neck was broken,” Nalls says. “But I wiggled my fingers and then my toes.”

Vlahos, Gill and Anderson rushed to the plane. Nalls opened the canopy and grinned at his frantic crew. “These babies practically land themselves,” he said.

D

DUSK ARRIVES IN CULPEPER.

The air show winds down. Nalls departs for the Country Club of Culpeper for dinner with a group from the Air Fest. The mechanics hang back, ready to replace the fuel pump. As night falls, they tow the Harrier to a well-lit hangar and remove a panel from the plane’s belly. Bryant Halford, 35, a Marine mechanic with a crew cut, uses a $\frac{3}{8}$ -inch speed-handle ratchet to remove approximately 50 tiny bolts that seat the fuel pump. He extracts the busted pump and moves the spare into position. The space is tight, so Halford is on his own, holding the 15-pound pump in place with one hand and replacing the screws with the other.

It’s 10 pm when he finishes the job, and the wrench gang heads to the country

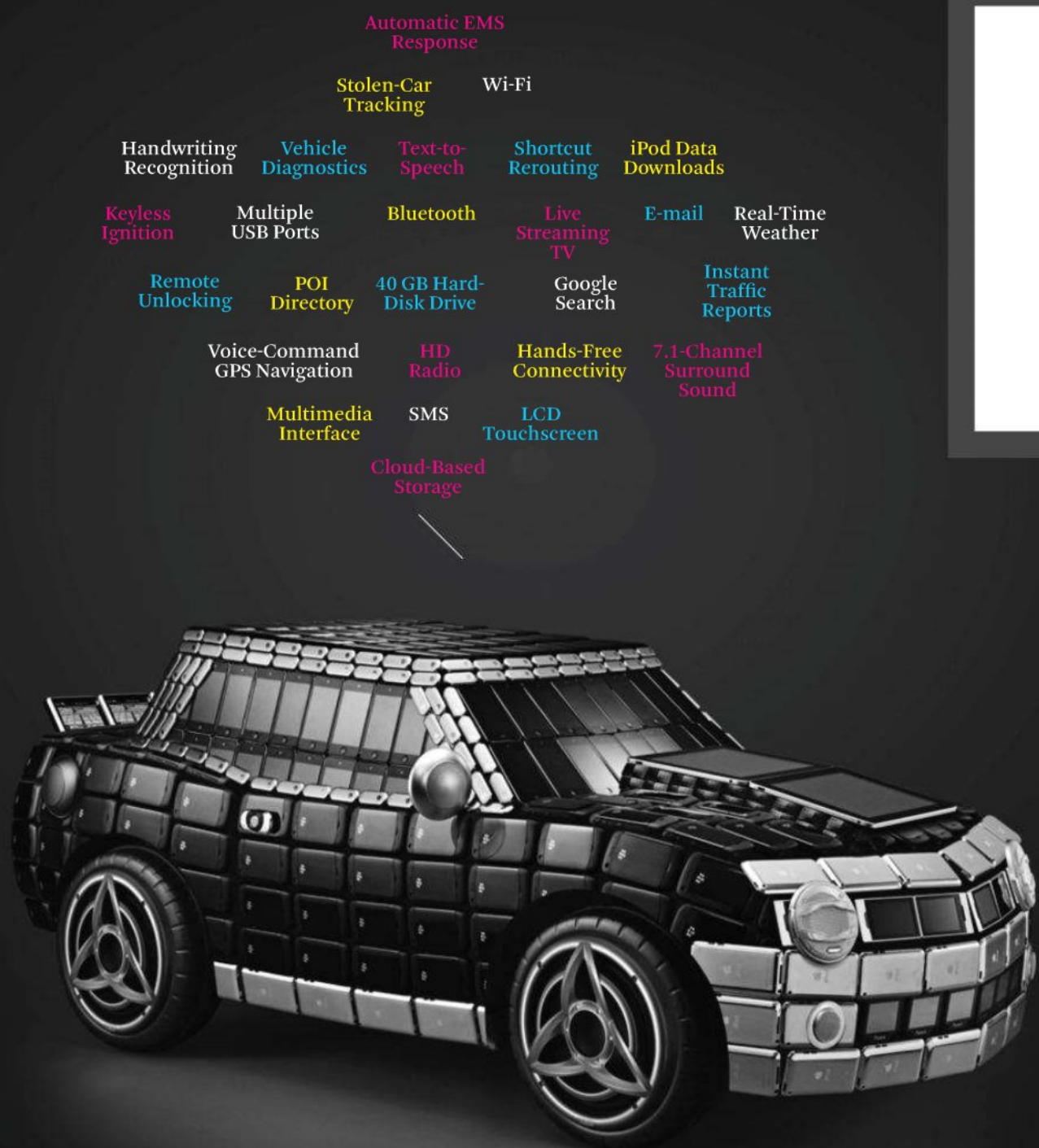
club to join Nalls. The smell of jet fuel trails the men into the wainscoted dining room, where they are met with a standing ovation.

AT ABOUT 6 O’CLOCK THE NEXT

morning, the Harrier is towed out of the hangar. A fuel truck rolls onto the scene. Neither Nalls nor the mechanics say much; the tension seems to rise with the sun. With 30 gallons in, the guys circle the plane, looking for telltale drops of fuel. “No leaks,” Halford says.

Joe Anderson dons his flight gear. With his wife and other family members—including two teenage grandchildren—looking on, he climbs into the cockpit and gives a thumbs up. The Harrier taxis toward the runway with a bone-shaking roar. Hot exhaust envelops the jet in a gauzy cloud. Anderson takes the aircraft up at a hard angle, swings back in front of the crowd and brings the jet to a hover. He reels the craft around, making it stutter-step and dance. It’s as though the Harrier has a personality; it’s rakish and eager to entertain.

After negotiating one more pirouette, Anderson goes full throttle and races skyward. The onlookers cheer, and Anderson circles back and lands smoothly. He deplanes, and there are hugs and high-fives all around. The wrench gang has saved the day, repairing XZ439 for another successful flight and giving Anderson “a rare gift.” “In the air, I was all business—on the radio with Art, checking my positions and settings,” Anderson says. “But once I was on the ground, I felt a huge thrill. This plane has special powers.” **PM**



Please, Say a Command

The car of the future is here, and it's a voice-activated, GPS-guided, Web-enabled wonder. PM tests the best of the high-tech crop.

BY G.E. ANDERSON

PHOTOGRAPH BY ADAM LEVEY
MODEL BY MEGAN CAPONETTO



Road Worrier: I got to wondering: Is this the end of the paper map? I like the feel of an atlas in my hands and the broad perspective that a map provides. But if the new GPS tech can distract a driver, a Rand McNally as big as a pizza box is worse. — MIKE ALLEN, PM SENIOR AUTOMOTIVE EDITOR

The female voice emanating from the dashboard of the \$18,000 Ford Fiesta asks which feature I want to activate.

"Services," I say.

"Connecting to services," the voice says. "Google Maps has sent you a location: 300 West 57th Street, New York, New York. Do you want directions to that location?"

"Yes," I say.

"Great," the voice says. "Hold on while I get your location."

How the navigation system "knew" the location of the POPULAR MECHANICS office is a technological marvel now familiar to many drivers of new cars. I used Google Maps to dial up and send the address, tagged with my cellphone number, to Ford's digital-information cloud. When I got behind the wheel of the Fiesta, the nav system recognized my phone via Bluetooth and downloaded the address from the cloud.

I was impressed. But to test the practicality of the system, I intentionally made a wrong turn—and the voice quickly gave me directions I knew were incorrect.

"Directions!" I barked.

"Turn right in 200 feet," the voice suggested, guiding me back on course.

Happy to be back on speaking terms with the car (I felt sort of bad for raising my voice), I gave a voice command to call Alan Hall, a Ford spokesman, whose name and number are coded into my phone. We were connected in a matter of seconds, and he admitted that the company's Sync system—while loaded with functionality—still has some kinks. "In cities, the navigation can be problematic," he told me. "Sometimes the buildings get in the way, so the system triangulates your position, and that doesn't always provide the most accurate location."

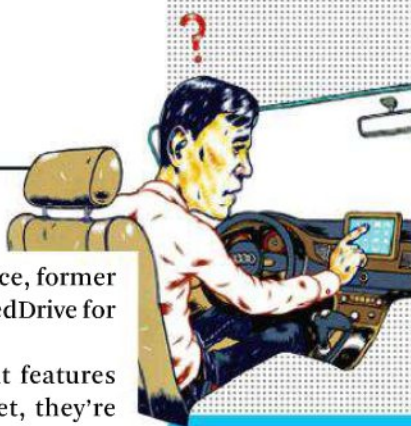
Finding tiny flaws in impressive systems is part of a PM editor's job description, and there has never been a better time to take a close look at the burgeoning array of information, entertainment and communication technologies now being stuffed into new cars. The automobile has reached a thrilling, historical turning point. In the past, cars owed their evolutionary growth spurts mostly to endemic tech; for example, the gas pedal (as opposed to a throttle mounted on the steering column), electronic ignition, hydraulic brakes and automatic transmission. But the current changes are fundamentally different—and, perhaps, more sweeping—because they're driven by advances outside the automotive realm, namely, in the fast-moving worlds of digital connectivity and information technologies. "I've been doing this for 10 years now, but so much has changed over just the past two, it's

astonishing," says Fran Dance, former service manager of ConnectedDrive for BMW of North America.

While auto-infotainment features are pouring into the market, they're still so new—and far from achieving standardization—that we decided to evaluate six of the most advanced systems. We chose vehicles from a wide range of price points, from a \$35,000 Ford Edge to a \$90,000 Audi A8, and tested three core functions: navigation, communication and entertainment (audio). We focused primarily on the systems' functionality and user-friendliness. How are the different features activated? Do they live up to their billing, improving the car's efficiency and enhancing the overall driving experience?

As few as five years ago, we wouldn't have been asking these questions. But in 2007, Ford introduced its Sync system, signaling the paradigm shift in driver-vehicle interface, or what the industry calls HMI, for "human-machine interface." (PM recognized Sync with a Breakthrough Award that year.) Today, as Ford launches Sync 2.0, known as MyFord Touch, every major automaker is racing to develop and introduce new "telematics and infotainment" features. The suite of features is mind-boggling: hands-free phone connectivity; navigation with real-time traffic updates and directions to the nearest restaurant (complete with a Zagat review); state-of-the-art audio; vehicle diagnostics; 911 assistance; automatic downloads of personal address books and music playlists from iPods, iPhones and BlackBerries; and even concierge services and Web-search capability. As if that weren't enough, the next-gen systems will routinely offer Wi-Fi, a range of social-networking technologies and more.

If you think that sounds overwhelming, you're onto something. The brochure for the MyFord system notes the consumer demand for "simplicity," meaning, more features with simpler



Imperfect Pairing: The control of my iPod varied. The Cadillac displayed the song list alphabetically (instead of retaining the device's menu structure), so finding tracks was tedious. Ford's Sync system replicated the iPod, but it took forever to download my library. My advice: Test the system before you buy.

— LARRY WEBSTER, PM AUTOMOTIVE EDITOR



Audi A8

Infotainment system: Multi Media Interface (MMI), standard

Pros: Excellent graphical interface for dialing phone numbers and addresses. Detailed search provides directions to nearby points of interest. Automatically loads thousands of iPod songs in seconds. Large LCD screen provides super-clear GPS maps and other

graphics, including a personal address book.

Cons: The Bluetooth connection to the testers' cellphones took a minimum of 3 minutes. One tester found the voice-recognition function "not that sharp" and often had to repeat commands. Failed to play videos stored on iPod.

Best feature: The touchpad converts handwriting to digital text commands, a clever layer of functionality not found in the other test cars. Want navigation to Denver, for instance? Use a fingertip to write "Co" for the state, and Colorado pops up; scrawl "De" for Denver; press Enter and you're locked in.

Grade:

A



Nowheresville: The BMW refused to accept the address for the PM auto shop in New Jersey, which is in a sparsely populated township. No combo of ZIP code, town or street names could pinpoint the location. I had hoped the system would be more intuitive, that is, able to chart a course based on the information I provided and the GPS overlay—but that wasn't the case. — MIKE ALLEN



BMW 7 Series



Infotainment system: iDrive, standard

Pros: The systems are intuitive, easy to use and loaded with features. (Just in case, there are written instructions

spelling out how to use the systems.) Maps display clearly on the HD LCD screen. Ease of use and clean design minimize driver distraction. The controls—in particular, the combination joystick/scroll wheel/Enter button—provide good tactile feedback.

Cons: Apple players require a special cable for hookup. Phone



pairing requires a passkey. Unable to access personal address book via voice command.

Best feature: Navigation destinations can be pinpointed with Google search. This makes for travel that's more efficient or more fun, depending on your goal.

Grade:

A

Cadillac CTS-V Sedan



Infotainment system: OnStar-based, standard, but with subscription fees for some features

Pros: One button—OnStar—activates all the features. GPS address input is a fast, two-step process, and the system provides excellent guidance. Very good audio quality; microphone is clear and true when using hands-free phone.

Cons: System controls are a mashup of dials, buttons and a touchscreen. Phone pairing does

not occur automatically, and there is no graphical interface for dialing.

Best feature: The Caddy's destination input structure is flexible and intuitive. For instance, when entering a navigation address, the user can start with the house number and receive instant feedback; other systems require rigid, hierarchical input (state, city, street, house number).

Grade:

C



Safe and Sorry: Unable to enter an address into the Lexus GPS while driving, I stopped on the shoulder of the Garden State Parkway to punch in the address. A New Jersey State Trooper pulled up behind me, lights flashing, and wrote me a ticket for making a non-emergency stop. — MIKE ALLEN



Ford Edge Sport AWD



Infotainment system: MyFord Touch, standard on Sport trim

Pros: Clean, cohesive panel graphics—as well as buttons on the steering wheel—make systems easy to use. Voice dialing is a snap:

Just press the Media/Voice button and say the name of the person you want to call. The navigation and system-readout screen is positioned beside the speedometer, so it's minimally distracting.

Cons: All of the systems were frustratingly slow to respond to voice commands (since our test, Ford has upgraded the software for quicker response).

Nav system does not allow driver to select a destination from iPhone address list.

Best feature: A single voice command can activate almost any function, and two supplemental LCD screens—one on either side of the speedometer—provide readouts of information selected via touchpads built into the steering wheel spokes.

Grade:

A–



Jeep Grand Cherokee



Infotainment system: Uconnect, standard; satellite radio service free for one year

Pros: Quickly (2 minutes or less) and automatically pairs with phone, downloading

contacts and playlists. Can store music and contacts on hard drive.

Cons: Navigation-screen graphics are uninspired, and it takes several unintuitive steps to display contacts. Routes selected by the navigation system not always the shortest or most direct.

Best feature: Like the Jeep itself, the system is simple and user-friendly; one voice command activates most functions.

Grade:

B+

False Positive: The A8 nav system warned of a major crash ahead on the Massachusetts Turnpike, suggesting an elaborate detour. I ignored it, stayed the course and found no crash.

— LARRY WEBSTER



Lexus HS 250h



Infotainment system: Lexus HDD Navigation System; \$2150 as tested

Pros: Audio tutorial gives thorough instructions on using the various features. Extremely responsive voice-command system; suggested shortcuts reduce driving time. Navigation system easily programs

addresses from personal phone.

Cons: Poor microphone quality on hands-free phone. The nav system has kinks. For instance, when a map is displayed, the function menu disappears and must be called up with a separate step. Also, zooming in and out is difficult.

Best feature: The console-mounted controller combines the functionality of a computer mouse and a joystick. The device provides tactile feedback, but we still think scroll wheels are easier (and safer) to use while driving.

Grade:

A-



interfaces. "And the pace of advancement is expected to continue unabated," the pamphlet notes, "posing a growing problem for drivers and engineers alike."

The problem boils down to driver distraction. In 2008, the last year for which national statistics are available, 5870 people died and an estimated 515,000 people were injured in crashes attributable to activities such as texting while driving and using in-vehicle technologies, the National Highway Traffic Safety Administration reported. Last September, after OnStar introduced a feature to let drivers check Facebook messages and update their status, U.S. Transportation Secretary Ray LaHood called for automakers to "put safety before entertainment."

But OnStar president Chris Preuss, who calls Facebooking while driving "safe," contends that the benefits of the new technologies outweigh the dangers. He cites a potentially life-saving crash-response system, now in testing by GM. "We can use it to tap into the 1600 sensors in your car and tell how fast you were going before your airbags deployed, and predict what kind of injuries you might have," Preuss says. "So, for instance, we can tell the doctor *before* you get to the hospital that you have a 70 percent chance of internal injuries and should get an MRI."

Preuss's comments point to automakers' ambitious plans for even greater integration of sophisticated information systems. One motivation is purely commercial: Luxury-car buyers expect the features to be standard equipment, and optional infotainment packages are all but a sure sell, regardless of price point. And if the tech evolves as expected, the safety issue may well be moot because future systems will be highly personalized and based almost solely on voice commands. This will reduce driver distraction as the connection between human and machine becomes seamless. Now, there's a future we can live with. **PM**

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diy

Home

Block Busters

WE PUT 11
HAMMER DRILLS
TO THE TEST
TO FIND THE
BEST TOOL—NO
HOLES BARRED.
BY ROY BERENDSOHN

➔ **Cordless drills are great.** But when you've got big holes to bore in concrete, only 120 volts will do. That's where the corded hammer drill comes in. It's a heavy-duty switch-hitter that goes from hammer to non-hammer mode with the flip of a lever, allowing you to ram a hole into concrete or bore into wood with equal ease. It might sound like a pricey tool meant for contractors, but it's not. You can join the hammer-drill club for as little as \$40.

We gathered 11 tools, chucked in a $\frac{5}{8}$ -inch Vermont American carbide-tip masonry bit and timed the drills as they bored through concrete blocks. Then we used a 1-inch spade bit in non-hammer mode to bore through 2x lumber. All the tools did well, but some were distinctly easier on the testers. Your search for the right tool starts here.

INSIDE

×

CLOSED-TOP CROWN + BOOT DRYER + WINTER WOODCUTTING

Best
Overall

BOSCH
1191VSR

**CHICAGO
ELECTRIC**
67616

CRAFTSMAN
315.101371

DEWALT
DW511

HITACHI
DV16V

Rating

Likes: Simply stated, the Bosch rocks. It's no secret why: Couple a 7-amp motor to an aggressive hammer mechanism and bring all of that power through a solid chuck, and you've got a tool that will blast through block and wood alike. The Bosch is also light, sleek and not terribly expensive.
Dislikes: Bosch should put the chuck key on a lanyard to keep it from getting lost, and simplify the over-engineered auxiliary handle.

Likes: If you have to bore through the wall while you're down in the bargain basement, this is your tool. It seems solid, and it turned in perfectly respectable times in block and lumber.
Dislikes: This tool held its own, but it does require more downforce from the operator. Like Bosch, Chicago Electric should attach the chuck key to a lanyard.

Likes: The tool may not blast through block and wood, but it does drill through both materials steadily, safely and predictably. It was the best-balanced drill—the others were front-heavy—and it was the only tool equipped with a push-button spindle lock, which made it much easier to tighten and loosen the jaws on the keyless chuck.
Dislikes: Nothing noted.

Likes: Guts. This tool has got 'em. It's not a matter of speed—it's what you get when you combine motor torque with a solid drivetrain. It shows up when you're near the bottom of the hole and the bit is bound up with chips or dust. The DeWalt powers through with minimal kickback while requiring little downforce from the user.
Dislikes: The black-on-black icons for hammer and drill settings are too hard to read.

Likes: What the snub-nosed .38 is to revolvers, the DV16V is to drills. It's a full inch shorter than the average design and about ¼ inch thinner. That stubbiness reduces the weight-forward feel of the drill and makes the Hitachi well-balanced. It whacks a nasty hole in concrete, too, as our time trial indicated.
Dislikes: A little more amperage would help improve its wood-boring ability.

● Test Results

PRICE	\$100	\$40	\$70	\$140	\$170
AMPS	7.0	6.5	6.0	7.8	6.0
MAX. RPM	3000	2500	1000	2700	2900
MAX. BLOWS/ MINUTE	48,000	41,600	16,000	46,000	46,400
CONCRETE (SECONDS)	3.97	4.02	8.42	4.67	4.19
LUMBER (SECONDS)	1.03	1.84	3.71	1.56	2.12



MAKITA
HP1641

MILWAUKEE
5378-20



RIDGID
R5013

ROCKWELL
RK3137K



RYOBI
D552H

SKIL
6445-01

Likes: You don't have to be left-handed to appreciate the Makita's Forward/Reverse switch with easy access from both sides of the tool. Also increasing the tool's ease of use is its low weight. At 4 pounds, it's several ounces to a pound lighter than comparable tools.
Dislikes: The Makita was among the four tools with 6 amps or less. We think a little more current is called for.

Likes: The Milwaukee is long, heavy (6 pounds) and powerful—an industrial tool, in other words. It has a motor that spools up to speed as smoothly as a jet engine, and a Jacobs chuck that would be perfectly at home on a drill press. If you bore big or very deep holes, or just want a tool with an anvil in its gene pool, this is your product.
Dislikes: Nothing noted.

Likes: This is a tool built for the dusty hell in which a hammer drill resides. It's got a lighted cord that shows whether the drill is powered, no matter how dark and dirty the environment. It has black-on-white icons for hammer and rotary drilling that are easy to read, no matter how filthy the tool gets. And its gigantic rubber-clad chuck key won't slip from your tired, sweaty hands.
Dislikes: Nothing noted.

Likes: The Rockwell turned in a performance perfectly worthy of the name hammer drill. We particularly liked its pivoting selector switch: Press a button to flip from hammer to rotary drilling.
Dislikes: Rockwell should fasten the chuck key with a lanyard to keep it from getting lost. And we were mystified by a small plastic square in the handle that looked like a power-indicator light but remained dark.

Likes: The Ryobi was one of our most affordable options in the test, and we were pleasantly surprised by its performance and features. For instance, it's got a big rubberized hook on its handle, for users who like to let the tool dangle a bit in their hand.
Dislikes: The Ryobi finished our time trials in short order, but it bucked and kicked its way through the hole, straining itself and the testers.

Likes: The Skil feels solid and turns in a respectable performance: It clocked the fastest time in concrete, even edging the Bosch by a hair. Yes, it does require more downforce and transmit more kickback to the user, but not in unreasonable amounts.
Dislikes: The function switch for drilling modes is stiff, and the lock-on button is oddly placed, at the bottom of the handle.

\$174

6.0

2800

44,800

5.19

2.10

\$250

7.5

2800

40,000

4.56

1.21

\$100

7.5

2700

51,000

4.5

1.28

\$100

8.0

2800

44,800

4.27

1.35

\$70

5.5

3000

51,000

4.26

1.63

\$112

7.0

3000

51,000

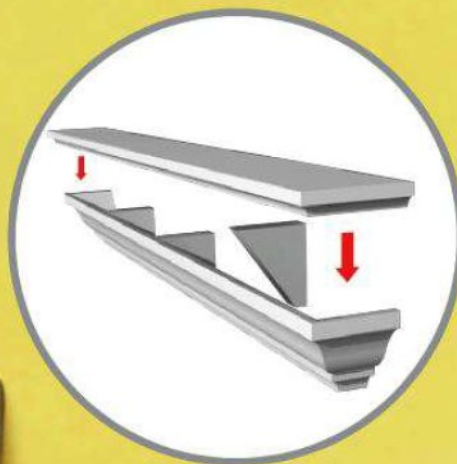
3.92

1.36

Homeowners Clinic

by Roy Berendsohn

Q A



Cover the crown with a simple shop-made cap with a decorative edge routed into it. Glue blocks provide a nailing surface.

Another problem is that baseboard trim is grooved on its back face. This means you'd have to orient the baseboard with the ogee edge faceup to hide the groove on the back of the trim. That certainly wouldn't look very attractive.

To find an alternative, I first looked at the architectural and trim-carpentry references at my desk. I was surprised that none offered an easy solution. Instead, they showed how to build up a complex molding assembly known as an architrave. That's too much work for most people. Then I considered using a solid foam crown molding. Yes, the back is filled, but I just didn't like the way it looked—not as crisp as wood molding.

Finally, I called contributing editor Joe Truini, a former finish carpenter. "The easiest way to handle this is with a pine cap that you make yourself," he said. To

do that, crosscut a piece of $\frac{3}{4}$ -inch-thick clear pine so that it's slightly longer than the crown and wide enough to project over the crown's front edge by at least $\frac{5}{8}$ inch. Then, rout a $\frac{3}{8}$ -inch-radius cove into the front edge and the ends of the cap. You can install it with the

The Crowning Touch

I want to install wood trim around the inside of my front door and top it with a crown molding. The problem is that the cavity behind the molding will be visible to anyone walking down the stairs. What do I do? I thought one solution might be to install a piece of baseboard molding on top of the crown.

A Typical baseboard molding can cover the crown molding and conceal the space behind it. And it's both simple to use and inexpensive. One problem, in my opinion, is that it's just too thin and its ogee edge too delicate to be attractive in this application.

A man in a dark suit is working on the landing gear of a small, light-colored airplane. He is leaning over, focused on his task. The background shows a clear sky and a flat landscape.

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The most common side effects of VIAGRA are headache, facial flushing, and upset stomach. Less common are bluish or blurred vision, or being sensitive to light. These may occur for a brief time.

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Please see Important Facts for VIAGRA on the following page or visit viagra.com for full prescribing information.

^{*}Data taken from the *Massachusetts Male Aging Study*. Of 1,290 respondents, 52% stated that they had some degree of ED.

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IMPORTANT FACTS

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IMPORTANT SAFETY INFORMATION ABOUT VIAGRA

Never take VIAGRA if you take any medicines with nitrates. This includes nitroglycerin. Your blood pressure could drop quickly. It could fall to an unsafe or life-threatening level.

ABOUT ERECTILE DYSFUNCTION (ED)

Erectile dysfunction means a man cannot get or keep an erection. Health problems, injury, or side effects of drugs may cause ED. The cause may not be known.

ABOUT VIAGRA

VIAGRA is used to treat ED in men. When you want to have sex, VIAGRA can help you get and keep an erection when you are sexually excited. You cannot get an erection just by taking the pill. Only your doctor can prescribe VIAGRA.

VIAGRA does not cure ED.

VIAGRA does not protect you or your partner from STDs (sexually transmitted diseases) or HIV. You will need to use a condom.

VIAGRA is not a hormone or an aphrodisiac.

WHO IS VIAGRA FOR?

Who should take VIAGRA?

Men who have ED and whose heart is healthy enough for sex.

Who should NOT take VIAGRA?

- If you ever take medicines with nitrates:
 - Medicines that treat chest pain (angina), such as nitroglycerin or isosorbide mononitrate or dinitrate
- If you use some street drugs, such as "poppers" (amyl nitrate or nitrite)
- If you are allergic to anything in the VIAGRA tablet

BEFORE YOU START VIAGRA

Tell your doctor if you have or ever had:

- Heart attack, abnormal heartbeats, or stroke
- Heart problems, such as heart failure, chest pain, or aortic valve narrowing
- Low or high blood pressure
- Severe vision loss
- An eye condition called retinitis pigmentosa
- Kidney or liver problems
- Blood problems, such as sickle cell anemia or leukemia
- A deformed penis, Peyronie's disease, or an erection that lasted more than 4 hours
- Stomach ulcers or any kind of bleeding problems

Tell your doctor about all your medicines. Include over-the-counter medicines, vitamins, and herbal products. Tell your doctor if you take or use:

- Medicines called alpha-blockers to treat high blood pressure or prostate problems. Your blood pressure could suddenly get too low. You could get dizzy or faint. Your doctor may start you on a lower dose of VIAGRA.
- Medicines called protease inhibitors for HIV. Your doctor may prescribe a 25 mg dose. Your doctor may limit VIAGRA to 25 mg in a 48-hour period.
- Other methods to cause erections. These include pills, injections, implants, or pumps.
- A medicine called REVATIO. VIAGRA should not be used with REVATIO as REVATIO contains sildenafil, the same medicine found in VIAGRA.

POSSIBLE SIDE EFFECTS OF VIAGRA

Side effects are mostly mild to moderate. They usually go away after a few hours. Some of these are more likely to happen with higher doses.

The most common side effects are:

- Headache
- Feeling flushed
- Upset stomach

Less common side effects are:

- Trouble telling blue and green apart or seeing a blue tinge on things
- Eyes being more sensitive to light
- Blurred vision

Rarely, a small number of men taking VIAGRA have reported these serious events:

- Having an erection that lasts more than 4 hours. If the erection is not treated right away, long-term loss of potency could occur.
- Sudden decrease or loss of sight in one or both eyes. We do not know if these events are caused by VIAGRA and medicines like it or caused by other factors. They may be caused by conditions like high blood pressure or diabetes. If you have sudden vision changes, stop using VIAGRA and all medicines like it. Call your doctor right away.
- Sudden decrease or loss of hearing. We do not know if these events are caused by VIAGRA and medicines like it or caused by other factors. If you have sudden hearing changes, stop using VIAGRA and all medicines like it. Call your doctor right away.
- Heart attack, stroke, irregular heartbeats, and death. We do not know whether these events are caused by VIAGRA or caused by other factors. Most of these happened in men who already had heart problems.

If you have any of these problems, stop VIAGRA. Call your doctor right away.

HOW TO TAKE VIAGRA

Do:

- Take VIAGRA only the way your doctor tells you. VIAGRA comes in 25 mg, 50 mg, and 100 mg tablets. Your doctor will tell you how much to take.
- If you are over 65 or have serious liver or kidney problems, your doctor may start you at the lowest dose (25 mg).
- Take VIAGRA about 1 hour before you want to have sex. VIAGRA starts to work in about 30 minutes when you are sexually excited. VIAGRA lasts up to 4 hours.

Don't:

- Do not take VIAGRA more than once a day.
- Do not take more VIAGRA than your doctor tells you. If you think you need more VIAGRA, talk with your doctor.
- Do not start or stop any other medicines before checking with your doctor.

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cove facing up or down. "I much prefer it facing down," Truini says.

Next, cut a handful of small glue blocks in the shape of truncated right triangles. Position each triangle on the inner side of the crown molding—the two perpendicular sides are against the wall and on top, like a shelf bracket, while the hypotenuse rests against the sloping inner face of the crown. Space the blocks along the length of the crown and glue them into position. (Don't attach the blocks to the wall, just to the molding.) Finally, lay the pine cap on top, and carefully nail through it and into the blocks. To avoid loosening the crown, Truini recommends using a pneumatic nailer to secure the cap to the blocks.

Warning Sign

I take the inspection cover off my gas furnace yearly and look inside. This year, though it seems to be running fine and heats the house nicely, I noticed some rust inside the cabinet. Do I need to call a contractor?

The only way to know whether there's something seriously wrong is to call a professional. The rust may be the result of ordinary wear and tear and condensation—or it can signal a dangerous mechanical problem.

Now, if you're talking about rust spots in the corners of the furnace cabinet, they're probably caused by condensation, especially if the furnace is at least several years old and located in a damp basement. On the other hand, if you're talking about a rusty heat exchanger, then you've got cause for concern. The exchanger is a hollow

sheet-metal assembly that gets filled with hot flue gas. The gas rushes through the exchanger and gives up its heat on the way to the chimney or exhaust vent. The furnace blower moves air over the exchanger surfaces, and this warmed air is blown into the house. A rusty heat exchanger can have pinhole leaks or even cracks that allow CO-containing exhaust into the house. Obviously, that's a very dangerous situation.

Another sign of a risky condition is a thick area of rust caused by exhaust condensation. High-efficiency furnaces have a second heat exchanger that extracts every last bit of heat energy from the flue gas. Moisture condenses out of the gas and must be drained away. This condensate is extremely acidic and corrosive. Rust can indicate that the condensate is not draining properly, but instead is leaking out and rotting the sheet metal.

Paper Trail

We've just moved into a house built in the 1980s, and the previous owners installed wallpaper in nearly every room. We'd like to strip it off and paint the walls. Some of the wallpaper is peeling off, but most of it looks very firmly bonded, unfortunately. How difficult will it be to remove?

Stripping wallpaper is a messy job and can be very time-consuming, even for pros such as John Callahan, a contrac-

tor in Morrisville, Pa. "Even when you use remover solutions and stripping tools, sometimes it's a real battle to get that stuff off the wall," he says. "Other times, it comes off easily."

Here's what Callahan recommends: First, run a wallpaper-scoring tool—which is about the size of a hockey puck and has spur-like wheels—over the wall surface until the paper is thoroughly perforated. Then wet the surface down with wallpaper-removal solution applied with a garden sprayer or a large soaked sponge. The solution will penetrate and soften the wallpaper and its glue. Let it soak in for a while. In dry weather, keep windows closed to keep humidity in the room high. Finally, scrape off the paper with as wide a knife as possible, to reduce the chance that the knife will gouge the surface.

You'll run into trouble if the previous owners failed to seal the wall with a wall-covering primer or a special coating known as wall size before applying the paper. That causes the wallpaper to bond very firmly to the drywall, making it a real challenge to scrape off the paper. "About all you can do is be as patient as possible," Callahan says. "Work slowly and reapply liquid wallpaper stripper as often as you think necessary."

No matter how careful you are, you are sure to beat up the wall surface. Be



PROBLEM SOLVED

A STICKY FIX TO DIRTY FOOTPRINTS

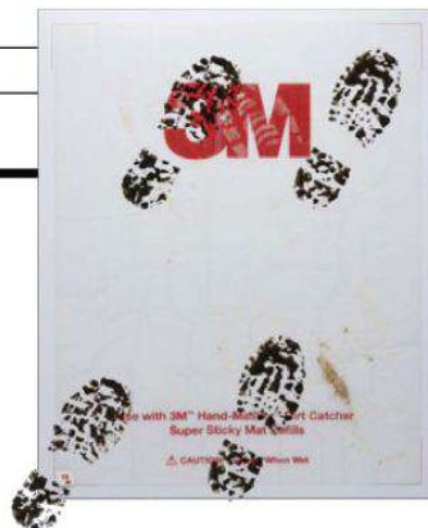
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Solution: Stop dirt in its tracks with a sticky mat.

→ Dust and dirt are the natural byproducts of work, but a mess doesn't have to be inevitable. Enter 3M's Dirt Catcher Super Sticky Mat. Place it at the entrance to your

workshop or near your work zone. As you walk on it, the mat pulls the dirt off the bottom of your shoes. Each mat consists of a nonslip rubber-backed pad and 15 peel-away plastic sheets measuring 24 x 30

inches. When the top sheet loses its tackiness, tear it off to reveal the next one. The starter pack (pad and 15 sheets) costs \$25; 15-sheet refill packs cost \$11 to \$13.



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PM DIY HOME /// HOMEOWNERS CLINIC Q+A

prepared to sand and skim-coat the wall with drywall compound. And it's not just the wall surface that's liable to take a beating during this job. The glop that you strip off the wall can make a mess on the floor. I'd tape a plastic dropcloth where the wall meets the floor, using masking tape, and I'd cover the plastic with a cotton-canvas painter's dropcloth. The plastic dropcloth protects the most vulnerable part of the floor, and the cotton dropcloth placed over it provides general protection and a non-slip surface to stand on.

Lights Out

We get a lot of wet weather down here in the Southwest in the winter, and every year my low-voltage outdoor lights go on the fritz. They've got those snap-together connections, the kind where you push the sharpened prongs on the lamp cord into the main cable. What's the solution?

I hate to say this, but with the weather you describe, your best bet is to replace the DIY setup you have now with pro-grade components. Everything is better with these systems: the fixtures, the wire and especially the wire connectors. Contractors who install landscape lighting, irrigation systems and invisible pet fences all need to make durable splices in low-voltage wire. The connections they make have to last for years, resisting wide swings in temperature and infiltration by dirt, water and lawn chemicals.

Blazing Products is one company that makes good connectors that let you skip the troublesome wire-piercing process. Instead, you strip the low-voltage wires and slip them inside a two-piece connector, much as you would when making a 120-volt splice. Next, you bend the wires over the connector's tip, then snap a latching cap over the splice to lock it in place. The connectors are filled with waterproof silicone grease. When you snap on the cap, you pump the grease over the wires. Double O-ring seals prevent water intrusion.

If scrapping your system is too much trouble, you can dig up the connections and make new pierce connections. That



A low-voltage wire connector has to be rugged. These two-piece connectors from Blazing Products shut tightly to keep out dirt and are filled with silicone grease to block moisture.

will work for a while—but you'll probably end up right back where you started.

Scraping By

I've got to replace the drum felt in our dryer, a repair I've done in the past on other machines. The problem is that it doesn't seem possible to completely remove the caulk that glues the felt to the drum. How do I remove it?

Well, you can relax. I know the instructions that come with the dryer felt say to take off the old caulk, but the stuff bonds so tenaciously that it's impossible to remove it fastidiously. "It's normal for there to be a little leftover glue on the drum," says Chris Hall, president of RepairClinic, an appliance parts provider in Canton, Mich. Just scrape off the old adhesive as best you can with a putty knife. Then wipe the drum down with denatured alcohol before gluing the new felt in place.

Cold-Weather Woodcutting

I heat with wood, and I always have problems with my chain saw during the coldest months, when I do most of my cutting. The saw gets cranky and doesn't cut well, and the nose sprocket gets loaded with frozen wood chips and doesn't turn. I bought a new saw a couple of years ago, and it's just as bad as the old one. What do you suggest?

Cold-weather woodcutting is a challenge. Well before the cutting season,

you should give the saw a thorough once-over. Clean it, removing the gunk that builds up around the chain sprocket and on the bottom of the sprocket cover. Inspect the chain groove, and clean it if necessary. Give the saw a fresh spark plug, clean the air filter, and if the saw has a shutter for the carburetor, switch it to its winter setting.

Next, drain the bar and chain oil and switch over to a thinner, winter-grade lubricant. You may be able to thin your bar and chain oil with a little kerosene or diesel fuel. The mix should be about 5 to 10 percent diesel or kerosene and the remainder bar oil. Check the owner's manual or ask a dealer before you run this home-brewed blend, though. Then make the most out of the lubricant by cycling the chain without cutting wood. This will flush ice and frozen wood particles from the bar and nose sprocket.

Frozen wood is hard to cut, so start the season with a freshly sharpened chain, and keep at least a couple of spares on hand. "When you sharpen a chain for winter woodcutting, decrease the top-plate filing angle by about five degrees," advises Randy Scully, the national service manager for Stihl, the outdoor power equipment company. The slightly less aggressive cutting angle will help the edge handle frozen wood while reducing vibration-induced wear and tear on the saw.

And if temperatures hover in the single digits or lower, consider a carbide-tip saw chain (but not the kind meant for firefighters; that requires training to use safely). This chain stands up better to frozen wood.

Lastly, make every effort to reduce the condensation that forms in your chain-saw fuel. "Try as best you can to keep the fuel mix at a constant temperature," Scully says. "If you can, avoid bringing the fuel container into a warm shop and then back outside into the cold, which will cause the moisture to condense in it." To ensure that the fuel you're using stays fresh, Scully suggests mixing as small a batch as is practical. Use that up and then mix some more two-stroke fuel when you need it.

Behind Door No. 1

I plan to start remodeling my house and want to add an outside door. We

have a choice to add the door on one end of the house or on the rear wall.

Since I'll be doing the carpentry myself, I'm wondering if there are differences in how the door should be framed in these two locations.

It's a lot of work to cut a door into any outside wall. For a typical house with a V-shaped, or gable, roof, the load from the roof moves along the rafters down from the point of the upside-down V (the peak) to the exterior walls that the rafters rest on. Loads from floor joists are also transferred to these exterior walls. In turn, the walls transfer the load to the foundation, which moves the load to the footings and distributes it into the soil below. This orderly progression is called the load path.

When you frame a door opening in a bearing wall (the wall that the rafters rest on), you need a way to direct that load around the door. To do this, you frame the opening for the door with a beam, called a header, across its top. The header for an exterior door is usually a 2 x 10 or 2 x 12, and it rests on framing members called jacks. The jacks take the load from the header to the

foundation walls and footing.

In theory, when you frame an opening in a nonbearing end wall, you don't need a header, since the only load that is being supported is that of the framing lumber above. There's no load from rafters or floor joists. Note that I say "in theory." If you live in a region with high winds or seismic activity, or if the house has a complex floor plan and an unusual roof shape that may distribute load to the end walls, then you will probably need a header over the door.

Also, you may have to reroute electrical and plumbing lines. Strip the interior wall surface before embarking on this remodeling job to find out if there are wires and pipes to move.

PM

Got a home-maintenance or repair problem? Ask Roy about it.

Send your questions to pmhomeclinic@hearst.com or to Homeowners Clinic, Popular Mechanics, 300 W. 57th St., New York, NY 10019-5899. While we cannot answer questions individually, problems of general interest will be discussed in the column.



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WET BOOTS RUIN A WINTER MORNING. SPARE YOUR TOES BY DRYING SNOWY SHOES WITH AN ARID BOX BUILT OF PLYWOOD AND PVC. BY WILLIAM GURSTELLE

1 → BUILD THE BOX The boots dry on perforated PVC pipes that waft warm, gentle air supplied by a light bulb and a computer fan. Build the box out of ½-inch-thick plywood, 1-inch deck screws, two light switches, a lamp holder, a lamp cord, a “rough service” 40-watt bulb (for safety, don’t use a higher wattage), a 12-volt DC 80-mm computer fan, a few feet of 1½-inch-diameter PVC pipe and smooth PVC couplings and pipe end caps.

Start by boring paths for the pipes to run through the box top. Drill four 1½-inch holes in a 15 x 15-inch sheet of plywood. Paint it. Cut four 15 x 6-inch side walls, leaving two edges short to account for the plywood thickness. Measure the fan; saw a square hole in one side to fit it. Cut a hole in a different side for the light-switch box. Attach the lamp holder in the middle of the action. Use the 1-inch screws to fasten the plywood sides into a square, but leave the top open. Seal the inner side joints with caulk.

2 → WIRE IT UP Mount the fan, light switches and lamp holder to the box sides. Wire the fan and 12-volt transformer to one light switch. Wire the lamp holder and AC power cord to the other. Add a bulb. Test the connections. Fasten the box top. Tilt the box if serious slush requires drainage into a pan.

3 → MOUNT PVC Cut a 6-inch length of PVC for every boot you plan to dry. Drill several ¾- and ½-inch airflow penetrations in each 6-inch pipe. Slip a smooth coupling over the pipe, leaving 1 inch exposed. Cap the opposite end and slide the open ends into holes in the box top. For drying a single pair (as shown above), cut a pair of small, non-perforated PVC pieces that can be capped when not in use.

4 → DRY BOOTS Wet boots on the pipes dry adequately in hours. An overnight stay yields blissful, total desiccation.

+ MORE TO DO
IN FEBRUARY

Blow Mo’ Snow →

South Dakota mechanic Gary Debeer has advice on how to prevent snowblower-belt blowout, the source, he says, of “ninety percent of the repairs I do midwinter.” The trick is to either thaw out the machine in the garage after using it or use a pick to chip away ice near the belt-driven auger and impeller.

Turn It Up →

Spew shavings at the Desert Woodturning Roundup, a three-day carve-a-thon (Feb. 18 to 20) in Mesa, Ariz., that organizer Kevin McPeck says will teach attendees the fine arts of bowl-making and chair-crafting.

Tap Sweet Sap →

Syrup expert Joe McHale of Tap My Trees gives the step-by-step: Drill a 2-inch-deep, 5/16- or 7/16-inch-diameter hole into a maple at least a foot across. Hang a bucket from a syringe-like spile and let the sap flow. “It’s all weather-dependent,” McHale says. “You want daytime temps above 32 degrees and nights below freezing.” Trees give up to 3 gallons of sap a day; 10 gallons boil down to 1 quart of syrup.

Drag It Out →

Feel bone-shaking vibrations from top-fuel, funny-car and pro stock drag racers Feb. 24 to 27 at the 51st annual Winter Nationals, the opening drag race of the season in Pomona, Calif.

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Alcohol Awareness

MOONSHINERS USED TO RUN THEIR CARS ON 190-PROOF HOOCH; YOUR MILEAGE MAY VARY. **BY MIKE ALLEN**

➔ **Most people realize** that all of us burn gasohol—a mixture of gasoline and alcohol—in our cars. Just about every gallon of gas pumped today contains as much as 10 percent domestically produced ethanol. Gummed-up fuel systems, damaged tanks and phase separation caused by stray moisture infiltrating fuel systems have plagued many consumers since this mixture debuted, and the problems will only get worse if government policy to increase the proportion of ethanol to gasoline is implemented. Don't get me wrong: Gasoline diluted with ethanol is a perfectly acceptable motor fuel when it's stored properly, dispensed promptly and burned in vehicles and power equipment designed to handle it. Which, unfortunately, is not always the case.

Moonshine It's Not

➔ **That 90:10 mixture** of gasoline and alcohol is referred to as E10, while a different blend of 15 percent gas and 85 percent alcohol is sold region-

The ethanol content of the gasoline in this flask was exactly 10 percent. But the water content was high at nearly 0.5 percent. Adding just a few additional drops of water caused all the water and alcohol to separate out, forming a layer of incombustible glop on the bottom.



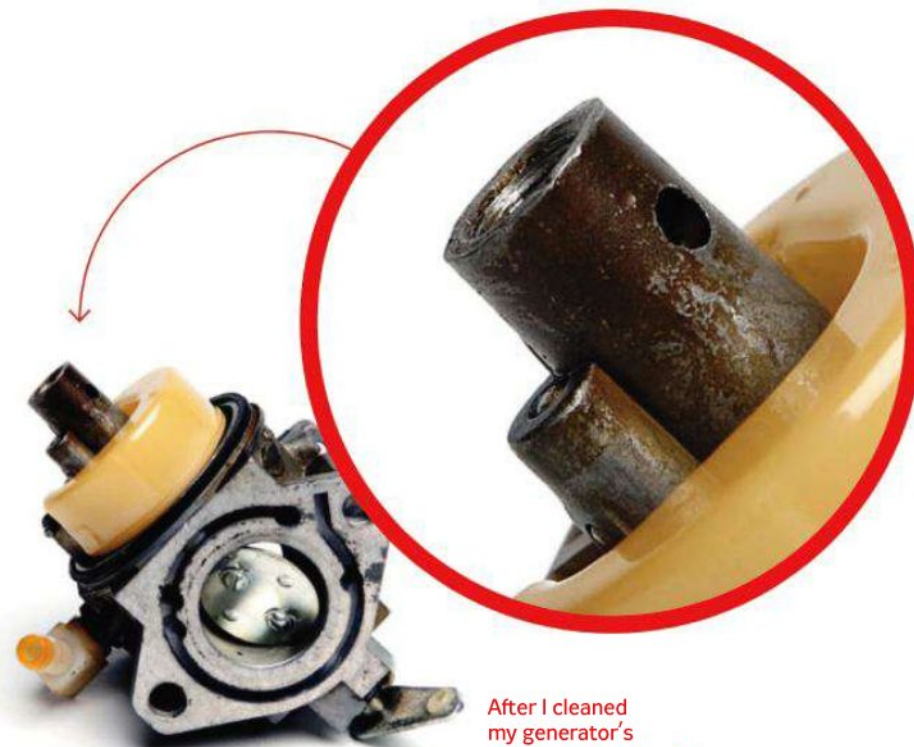
INSIDE

× GROUND SOURCING + TRAILERING UPDATE + DEALER SHENANIGANS

ally as E85. On this scale, straight petroleum-based gasoline is referred to as E0. Most gasoline dispensed from pumps in this country is as much as 10 percent ethanol, distilled from corn grown in the Midwest. This alcoholic cocktail was originally mandated by the EPA as a replacement for MTBE (methyl tertiary butyl ether), an oxygen-bearing petroleum-sourced chemical that was added to pump gasoline starting in 1979 to reduce carbon monoxide emissions in some regions that had problems meeting government air-quality standards. The oxygen in the MTBE (and ethanol) molecules can substantially reduce CO emissions in vehicles without modern closed-loop fuel-injection systems, which were introduced starting in the '80s.

Soon after, MTBE started turning up in groundwater, affecting the taste and smell of drinking water, so ethanol was substituted. (Shockingly, MTBE isn't considered toxic or even carcinogenic in the concentrations found in groundwater, but still.)

However: If the beneficial effects of oxygenated fuel have largely been bypassed by modern feedback-loop injection systems, which control the air-to-fuel ratio much more closely, why is ethanol still in your fuel? Because the second President Bush made a decision



After I cleaned my generator's carburetor in a bucket of carb cleaner, the inside was in as-new condition. E10, however, left these deposits within 60 days of sitting during last summer's hot and humid weather.

to offset some of our dependence on foreign oil with domestically produced alcohol, and the Corn Belt senators agreed. Ethanol plants have mushroomed, ramping up U.S. production from 1.77 billion gallons in 2001 to 10.75 billion gallons in 2009. Politics aside, odds are near 100 percent that there's as much as 10 percent alcohol in the gasoline you're pumping into your car and that 5-gallon can you use to fuel all your other gas engines.

Keeping Water Where It Belongs

➤ **The ethanol in your gas tank** is uniformly dissolved in the gasoline. Alcohol

tends to absorb and hold water, and in concentrations in the tank up to about 0.6 percent, any water remains in solution, presenting no problems. (Yes, there are other problems with alcohol in the fuel system, but we'll get to them later.)

How does water get into the fuel tank? It's possible that water dripped into the tank at the gas station or refueling depot, or a stray raindrop or snowflake made its way into your tank or jerrycan, but most water infiltration is from condensation. As the temperature in a tank changes, air has to be vented in and out or the tank will bulge or split. Incoming air carries moisture. When the H₂O in the gas gets above a critical percentage—its saturation point—all of the water and alcohol drops out and settles into the bottom of the tank. This is what chemists call phase separation; the various components of the fuel are no longer a homogeneous mixture.

But phase separation does not occur only from increased water concentration, which is actually unlikely in a modern, emissions-sealed automotive fuel system. The temperature of the fuel



BACK TO THE FUTURE

COOPERATING WITH THE INEVITABLE

You've got an older vehicle designed in the pre-OPEC era of pure petroleum-based 98-octane motion lotion. How can you keep it on the road without trailing along a 55-gallon drum of alcohol-free racing gas? Eastwood has a huge mail-order business catering to antique and

muscle-car restoration products, so we asked product manager John Robinson how to keep our Bad Ride running.

"Older vehicles running E10 often have driveability issues and poor fuel economy, so keep them properly tuned to avoid problems," he says. "If you do

manage to get the car started after phase separation, if you've used high-octane gas, you'll avoid pinging caused by the octane reduction."

What about those dirt bikes and chain saws that use fuel mixed with oil? "Two-strokes are very vulnerable to

water-contaminated fuel because water is more attracted to the metal inside the engine than oil is, which can cause premature rusting," Robinson says. "Don't store fuel more than a few weeks, and if you must store a vehicle or tool, drain the tank."

is a factor as well. Here's the scenario: You fill up the car or gas can with fuel that, for a variety of reasons, is near its water-saturation point and at 60 degrees. Overnight, the temperature drops 20 degrees, and all the water and alcohol settle out even though no extra water has crept in. Guess what? The engine won't run when the fuel pickup is sucking up the alcohol-water mix.

Worse yet, the gasoline remaining above the water has probably lost three octane points, because today's gasoline relies heavily on the high-octane equivalence (130) of alcohol to achieve its octane rating. It's also missing a bunch of additives that stayed in the alcohol—so the entire tankful should be drained and disposed of as hazardous waste.

And no, adding *more* alcohol, in the form of fuel-line de-icer, lacquer thinner or cheap vodka, will never restore that gasoline to usefulness. You don't want to add yet more alcohol, lest the increased concentration turns your carburetor float to Jell-O. The only acceptable way to attempt to save the gas in the tank is to add a large amount of gasoline that's got a very low moisture content. Problem is, there's no good way to tell if pump gas has a little or a lot of water on board. You stand the chance of having twice as much phase-separated, unusable gasoline as before. Better to dispose of the whole tankful.

Other Alcohol Issues

➔ **Alcohol is corrosive** and can degrade plastic, rubber or even metal parts in the fuel system that weren't engineered to use alcohol-bearing fuel. Consequently, that antique Evinrude outboard or '60s lawn tractor you bought at the swap meet might need upgrading to stay together on today's gas. That means corrosion-resistant tanks, alcohol-tolerant rubber lines, seals and fuel-pump diaphragms, and plastic fuel-system parts that won't swell up in the presence of alcohol. Vintage boats with internal fiberglass tanks often have issues with the coating inside the tank failing, sometimes requiring massive structural modifications. Highly tuned two-stroke engines will run leaner (and consequently hotter) on the lower Btu/gallon alcohol mix, potentially leading to melted pistons and scuffed cylinder walls.



LOOKING AHEAD

E15 IN YOUR FUTURE?

The EPA has officially signed off on the legality of using E15 in 2007 and newer cars, based on testing that showed no problems in engine performance, durability or emissions. Why on earth do we need E15? It's the Blend Wall. By passing the Energy Independence and Security Act of 2007, Congress mandated that 15 billion gallons of corn ethanol be blended into the nation's gasoline supply by 2015. Last year's U.S. production of 11 billion gallons will ramp up to 22 billion by 2012. The amount of alcohol in gas must therefore be increased. Jeff Broin, CEO of Sioux Falls, S.D.-based POET, the nation's largest

ethanol producer, says that the ethanol industry would like to increase that 15 percent to 20 percent—or more. All of which is okay in vehicles engineered to use it, but what about those that aren't? Broin suggests that in the future, "consumers will be able to dial up the concentration of ethanol they'd like to burn at the pump, from zero to 20 percent or more, just like they choose their octane rating today." That's exactly what those of us with older cars, tools or toys will need. Problem: Getting different blends to the consumer will require massive

infrastructure changes. Gas-station owners will have to upgrade existing pumps to handle E15 and higher concentrations. The blending pumps Broin is suggesting will cost more than a typical \$20,000 conventional unit. In addition, station owners will have to install more tanks. An energy policy that mandates more domestic production sounds like a great idea. But sneaking more ethanol into the supply stream at the expense of people who rely on their cars, boats and outdoor power equipment might better be left to the marketplace and not to bureaucrats.

Alcohol will also scour varnish and deposits out of the fuel system that have remained in place for years, which will eventually wind up in the filter or main jet, choking off the engine's fuel supply. Worse yet, the alcohol itself oxidizes in the tank and produces a tenacious brown glop that's far more damaging to fuel systems than the varnish we're used to seeing in pure petroleum fuels. In warmer weather, you can see varnish starting to form within a month of dispensing fresh fuel into a vehicle tank or storage can.

Advice

➔ **The common question I get:** Where can I buy alcohol-free gasoline? You probably can't, except at a very few stations, and odds are it's very expensive high-octane racing fuel that's not legal for road use.

To avoid phase separation, avoid long-term fuel storage. Trash that old

5-gallon can with the rag stuffed into the filler neck and trade up to a 2-gallon can with a decent, vented cap. I used to recommend storing outdoor power equipment, boats, ATVs and motorcycles with full tanks to prevent rusting. Now I recommend draining the tank, running the engine till it quits and then fogging the inside of the tank and the cylinder with oil to prevent corrosion. No E10 in the tank equals no water absorption and no phase separation.

We've always recommended using fuel-stabilizer products for gas-powered vehicles or tools that aren't regularly used. E10 makes that advice even more compelling. We've tried products formulated for blended gasoline from Star Tron, Eastwood and Sta-Bil. There are others. Beware of products that claim to prevent phase separation: It's unlikely that they can eliminate the phenomenon, although some products do claim to delay it.

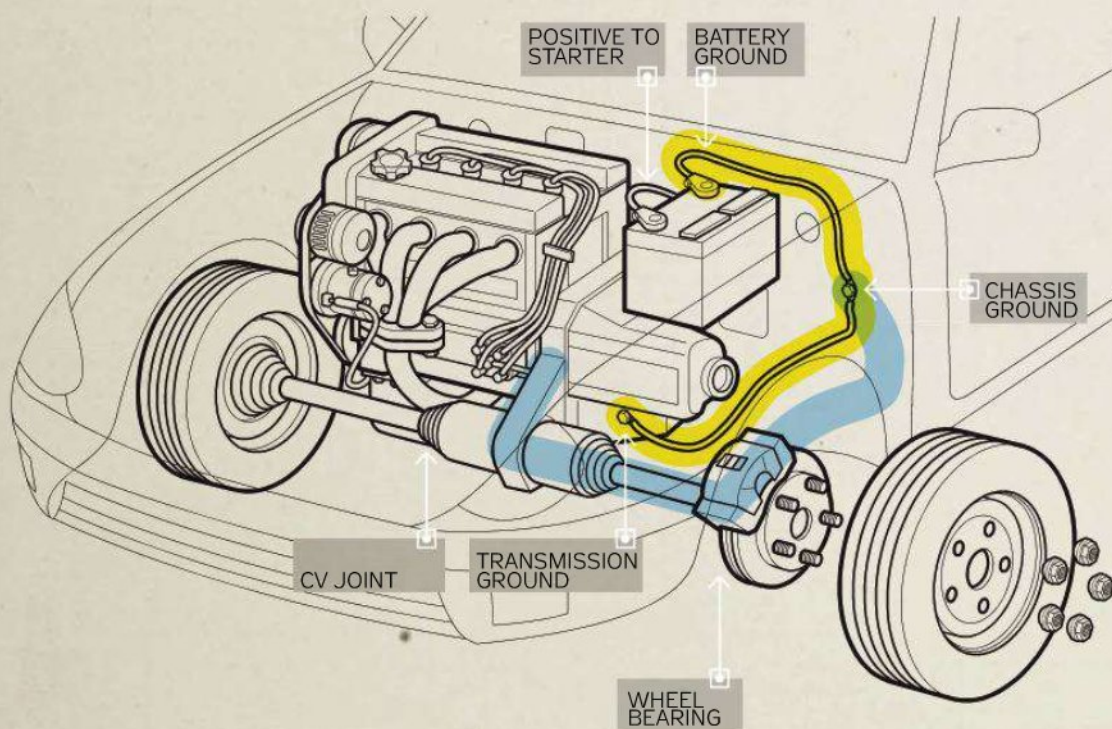
PM

Car Clinic

by Mike Allen

Q+A

STARTER WIRING



AS DESIGNED

The normal path for the current running back to the battery—from the engine block to the battery negative—is a ground strap. There may be a separate strap to the body, or the strap may make a stop at the chassis ground point on the way.

GROUND SOURCING

If the ground connection between the engine/transmission block and the chassis is poor, the high current needed to run the starter motor will source the path of lowest resistance—through the wheel bearings, axles and CV joints.

Alternative Energy

I've replaced four CV joints and three front-wheel bearings on my car in the past six months. The bearings and CV joints all show signs of damage and made awful noises within weeks of being installed. It's happening on both sides of the car at random. My mechanic has tried different suppliers—but has no clue as to what the problem is.

A This is one I've encountered more than once before. You have a bad ground connection between the battery and the engine block or transmission case, wherever the ground strap terminates. At the same time, you've got a good ground between the battery negative post and the car's chassis. When you turn the key to start the car, the starter motor needs several hun-

dred amps for a few seconds, which typically flow through the starter to the engine and back to the battery. In your case, that engine ground path has too much resistance, so the current finds an easier, lower-resistance way from the engine to the chassis, passing through the wheel bearings, axles and CV-joint internals. The high current, transmitted through small points of contact between the machined races and the rollers or balls, strikes tiny arcs, damaging the smooth surfaces. Within a few hundred miles, the joint or bearing fails.

I've seen older cars with mechanical throttle cables and conventional rear axles do the same thing, only in their case, they sourced the ground connec-

tion along the throttle cable, which turned as red as the wire inside a toaster oven when you twisted the key. I'd replace all the battery ground straps and clean all the areas where the straps attach with a wire brush and DeoxIT contact cleaner. Assemble with new hardware and some copper-bearing antiseize compound and your problem should cease.

Confused Directionals

Why would my left turn signal turn my hazards on? It's a 2007 Saturn Vue.

I changed the fuse for the parking lamps, checked the relay for the headlamp and checked all connecting wires. I need help, please!

One of your left turn-signal lamps, front or rear, has partially burned out and has shorted between the two filaments. If you look carefully inside the glass envelope of the bulb, you'll see the tiny tungsten wire adrift from its standards and touching the other filament. So it's not *really* your hazards on, it's all four parking lamps lighting up, in addition to the two turn-signal lamps. This is not that uncommon, actually.

Wax On, Wax Off

We here at the lunchroom are having a difference of opinion on whether it is necessary to wax a car that has clear-coat finish, despite what the salespeople would tell us. We know they like to sell wax.

That clear-coat paint is still just paint, and it needs to be waxed, the way paint has always needed to be waxed, to protect the surface from acid rain, airborne dirt and chemicals, and UV light.

Where Are My Tunes?

The battery in my 2006 Mazda got weak, so I replaced it myself with a new battery. The audio system doesn't work anymore. What did I do wrong?

Letting the battery go dead, leaving the lights on, removing the radio fuse, or disconnecting or changing the battery can do this to many radios. Interrupting the voltage supply to the battery has activated the radio's anti-theft code. That way, if someone steals the radio, it's useless without the code.

Somewhere in the paperwork that

came with the car should be a card with the radio's security code. If you can't find it, you'll have to go to the dealer and pay to have them reset it. If it gets to that, be sure they give you the code for next time.

Owners of older cars with anti-theft radios can sometimes find a usable code on the manufacturer's website, or on a website specific to the car or radio brand or model.

You'll find directions for entering the code in the owner's manual.

Power Crisis

I live in an apartment complex north of Los Angeles, and in the winter it gets cold enough that my motorcycle's battery always dies before spring.

I have no way to connect my bike's battery to a trickle charger. Is it possible to somehow house the battery under the hood of my truck and safely connect it to the truck's electrical system, so that the battery won't die during the couple of months that I don't use my bike?

I'm assuming that the maintenance of

PM DIY AUTO ///
CAR CLINIC Q+A

domestic tranquility prevents you from bringing the battery into the apartment for the duration of the winter, there to languish on the battery maintainer.

If so, your idea of temporarily sistering the bike battery to your truck battery is an excellent one. It'll keep it properly charged and ready to go in the spring. I'd find some convenient place to tie it down—many pickups have a second battery tray for towing applications.

Just wire it in parallel with the truck battery. I'd use an inline fuseholder, fused to about 10 amps, on the positive side. If you're really ambitious, find a circuit that's hot only when the key is on and connect to that. That way, if the truck battery goes dead, you won't deep-discharge the bike battery too.

Or you could do like I do and ride at least once a month all winter. Heated grips and a heated vest will keep you toasty. It'll also be better for the rest of the bike to get some regular exercise. It's not *that* cold in LA.



TOOL OF THE MONTH

LIFTING WEIGHTS



Jacking up a truck is something I do regularly. And often it's not in the shop, with access to my floor jack. Out in the field, it's a far more portable bottle jack that gets thrown in the back, as well as a pair of sturdy jackstands for safety after the truck has been lifted. (Never work under a vehicle that's on a hydraulic jack—a blown seal can vent the hydraulic fluid rapidly enough to crush you like a bug.) That's why I like these All-in-One 3-ton truck jacks from Alltrade Powerbuilt. They've combined a ratchet-style safety stand with a hydraulic jack. Another cool feature is that you have to find only one place to lift and hold up the truck, not one for the jack and another for the stand. This baby lifts from 11 to 21 inches and lists for \$63.99, and I've seen 'em for less. That's less than what a good jack and a stand cost combined. And it's less clutter around the shop too. — M.A.

Monkey Business

I bought my 2001 Honda Accord brand-new from a dealer. I have done all the maintenance on this vehicle myself. The other day I found that someone had wired a simple on/off rocker switch under the dash. I switched it off, with no obvious side effects. The wire disappears within the wiring harness. My question is, why would anyone put a switch in that spot? And what would it accomplish?

My guess: to deactivate the odometer. Are you sure that car was really new when you bought it? If you didn't install that switch, the dealer must have, because no one else had access to the car. Then they could drive it around as a demo, the sales manager's personal vehicle, or a parts chaser for a while, and still sell the car as a brand-new vehicle. Yes, that's illegal. A second, less nefarious explanation is that your car was a dealer trade, one that was delivered to one dealer and then swapped

for another because the second dealer needed a specific trim level or color—but turning off the odo during the swap is still illegal. I can't think of any other reasonable explanation.

Stuck on You

What type of glue can bind acrylic plastic/polyurethane to anodized aluminum or beaded aluminum? I have been using a CA epoxy, and it holds for some time, but it always leads to a failure at the seam.

You're using *either* a CA (cyanoacrylate) or an epoxy. The two types of adhesives do not overlap. Cyanoacrylates are the same stuff as Super Glue and come as either a fluid or a gel. Generally, they set up within seconds of the joint being assembled and have a bad habit of gluing your fingers (or at least mine) to the workpiece or each other.

Epoxyes are two components that must be mixed before the parts are assembled. Cure times range from a few minutes to overnight.

Neither type is suitable for gluing polyurethanes or acrylic plastics to metal. The metal is rigid, the plastic is

not, and the joint line is too brittle. Also, the aluminum expands and contracts with temperature changes more than the plastic does, again causing cracks.

You need an adhesive with adequate grip and strength, but one that will also allow a little flex in the joint. For low-strength applications, even a bead of silicone gasket sealer should work. Next, I'd try hot glue, although it sometimes is difficult to get the whole piece assembled before the beginning of the joint line cools off too much.

Depending on what you're assembling, a caulking gun full of ordinary construction adhesive would do a great job. For high-strength applications, you'll need to go to an engineering-grade adhesive, like 3M Scotch-Weld Acrylic Adhesive DP805 or something similar. This product is a two-part as well. You'll need to source it from an industrial supply house, not the local hardware store.

A Draining Experience

I had this problem recently on a 1976 Corvette: My meter showed a 200-milliamp drain with the key off.

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Seeing that the fuses are behind and above the clutch pedal, I really wanted the culprit to be something that didn't go through the fuse block. When I disconnected the alternator, the drain completely disappeared. I was able to find one shorted diode in the rectifier (I would have thought it would take two to get a path to ground), and a new alternator solved the problem.

Amazingly, an alternator with a shorted diode—there are six in total—will usually (barely) keep up with battery charging and running the car but discharge the battery in spite of the key being off. **PM**

Got a car problem?

Ask **Mike** about it. Send your questions to pmautoclinic@hearst.com or over Twitter at twitter.com/PopMechAuto or to Car Clinic, Popular Mechanics, 300 W. 57th St., New York, NY 10019-5899. While we cannot answer questions individually, problems of general interest will be discussed in the column.



NOW YOU KNOW

UNDERSTANDING THE SAE'S NEW TRAILER-TOWING STANDARD

Exactly how much weight is safe to tow behind your truck or car? Every manufacturer has a number, specifying the maximum avoidupois you can drag along behind, for every vehicle. The problem has always been that every manufacturer has used different criteria for deducing these ratings, making direct comparisons difficult. Thankfully, that's about to change.

When it comes to a truck's capability, no spec carries more weight—literally—than a trailer weight rating (TWR). And in recent years pickup-truck TWRs have ballooned. Twenty years ago, a Chevy 1500 pickup could tow a maximum of 7500 pounds. Today's Chevy C/K 1500 truck is rated to handle a whopping 10,700-pound trailer.

Unfortunately, TWRs seemingly have increased almost arbitrarily. As soon as one truck sets the benchmark, a competitor tops that number, often with no obvious change to the mechanical specifications of the truck. It's a game of one-upmanship, fueled by bragging rights and marketing needs. So one manufacturer's claimed ability to handle a 10,000-pound trailer may not align with another manufacturer's.

That all ends in 2013, when automakers adopt the new Society of Automotive Engineers (SAE) J2807 trailer-towing standard. "There shouldn't be any more stroke-of-the-pen-type changes to trailer weight ratings," says Robert Krouse, GM trailering engineer and chair of the tow standard committee.

The committee, which began work on J2807 back in 2006, essentially came up with a two-part standard. The first section outlines a series of performance requirements to establish a vehicle's Gross Combination Weight Rating (GCWR). The tests include a regimen of acceleration (on flat ground and at a 12 percent grade) and braking and handling tests, as well as measurements of a vehicle's cooling system performance with standardized trailers.

One of the most important tests is the highway grade requirement, which specifies a minimum speed the vehicle must maintain on the Arizona SR 68 Davis Dam grade between Bullhead City, Ariz., and Golden Valley, Ariz., averaging more than a 5 percent upgrade for 12 miles. And of course,

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the test must be accomplished in weather no cooler than 100 F, with the a/c maxed out on the minimum temperature and highest fan speed. "Davis Dam is generally perceived as one of the most stringent grades and probably has the most widespread use among automotive engineers," Krouse says.

The second part of J2807 outlines how to calculate the TWR from the GCWR. The trailer weight rating has always worked out to GCWR minus the tow vehicle weight—that part hasn't changed. What has changed is how vehicle test weight is determined. In the past, manufacturers would use essentially a "stripper" model and one 150-pound driver for tow testing because that model would weigh the least and thus allow for both a higher payload and tow capacity at the same GCWR. But SAE J2807 says that the trucks must be equipped with the same options as the ones the EPA uses for its fuel-economy testing—options that are ordered on at least 33 percent of the trucks, such as air conditioning, electric mirrors or power windows. Those add up to about 100 pounds of equipment not on the base truck. The J2807 standard also specifies that a 150-pound driver and a 150-pound passenger be on board and that the weight of the hitch and related parts be counted too.

Trucks with a GCWR of more than 8500 pounds, which are not rated by the EPA, must carry a 100-pound ballast to account for the weight of a representative amount of options and the hitch components, all in addition to those two 150-pound occupants.

In the past, the amount of tongue weight (or in the case of a fifth wheel or gooseneck, the kingpin weight) a truck should carry was not standardized. Peter Frantzeskakis, Ford's chair on the SAE committee and vehicle engineering manager for Ford Trucks, says the kingpin load manufacturers used in the past could range from 15 to 17 percent. The SAE J2807 standard now specifies a 10 percent tongue weight for a conventional hitch and 20 percent for fifth wheel or gooseneck kingpins. "If you had a 10,000 trailer rating in the past, calculated with a 17 percent kingpin load, and now you have to recalculate

using 20 percent—you have about a 300-pound delta that you have to find a way to manage," Frantzeskakis says.

As one might imagine, the combination of the increased test weights for tow vehicles plus the increased tongue- and kingpin-load weights will likely conspire to lower the TWR of many vehicles. Krouse says that single-rear-wheel (one-half- and three-quarter-ton) trucks will be most affected, because the increased kingpin weights combined with increased vehicle test weights could easily exceed the load ratings for the single rear tires and the

suspension. "Certainly the biggest concern is in the spring design. Can it actually carry that incremental load?" Frantzeskakis says.

Toyota has already met the standard with many of its pickups and body-on-frame SUVs. The Tundra's TWRs were lowered from 400 pounds up to 1100 pounds on the heaviest models. Every manufacturer's numbers are likely to dip in 2013. The upshot: TWR specs will finally become as easy to compare as horsepower, torque and tire sizes. — BEN STEWART

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Fighting RF Interference

WHEN GADGETS TALK TO EACH OTHER UNINTENTIONALLY, THE RESULTS CAN BE A WIRELESS MESS. BY JOHN HERRMAN

After an eternity of chatter and commercials, the radio DJ is about to play the song you've been waiting for. Then, after a moment of pregnant silence, you hear it. No, not your favorite tune, but your least favorite sound: a *bzzt-baba-bzzt-baba-bzzzzzzzt* that pierces through your car-stereo speakers. The jarring interruption is as familiar as it is mysterious.

Within moments a cellphone will ring, either in the radio studio dozens of miles away, or inside your own vehi-

cle. That's because what you've just heard is the noisy pulse of a cellphone's transmitter, amplified by either the station's studio equipment or your car's stereo. What you experienced, in other words, is radio-frequency interference, or RFI.

RFI takes many forms, and they're all ugly: A humming microwave chokes a Wi-Fi connection; a baby monitor brims with noise; an audio recording made with a laptop fizzles and pops. RFI has been an irritant throughout

INSIDE



FACEBOOK GROUPS + NETFLIX SHARING + IPHONE MISDIALS

mankind's love affair with electronics, particularly with wireless gadgets. So what is it? How can you stop it?

Radio Overactive

➔ Electromagnetic radiation lies behind everything from gamma rays to visible light to your kid's walkie-talkie. We use only a portion of the spectrum for wireless communication, the broad swath from about 30 Hz to 300 GHz. (High-school physics refresher: Wavelengths get shorter as frequency gets higher, and a 1-GHz wave measures about 12 inches.) Range, antenna size and cost requirements conspire with stringent government regulations to relegate most personal electronics to an even narrower range of frequencies. This, a thin, patchy section of the electromagnetic spectrum below 5 GHz, is where our gadgets live. Cellphones, depending on the carrier, communicate at 850 MHz, 1.7 GHz and 1.9 GHz. Wireless home phones broadcast at 900 MHz,

1.9 GHz, 2.4 GHz and 5 GHz. FM radio spans from 87.5 MHz to 108 MHz. Many routers, along with all Bluetooth devices, transmit at 2.4 GHz. And with so many gadgets hanging around in such a narrow range of frequencies, things can get crowded. Signals can get crossed, literally.

"Consumer electronic devices are designed to be used in a certain environment and interact with electromagnetic fields," says Carnegie Mellon electrical and computer engineering professor James Hoburg. "And then you come along with a source that's creating electromagnetic fields that weren't intended to be in its environment." Like a noisy engine in the background of an audio recording, radio-frequency interference is the result of a device "listening" for one signal at a specific frequency and

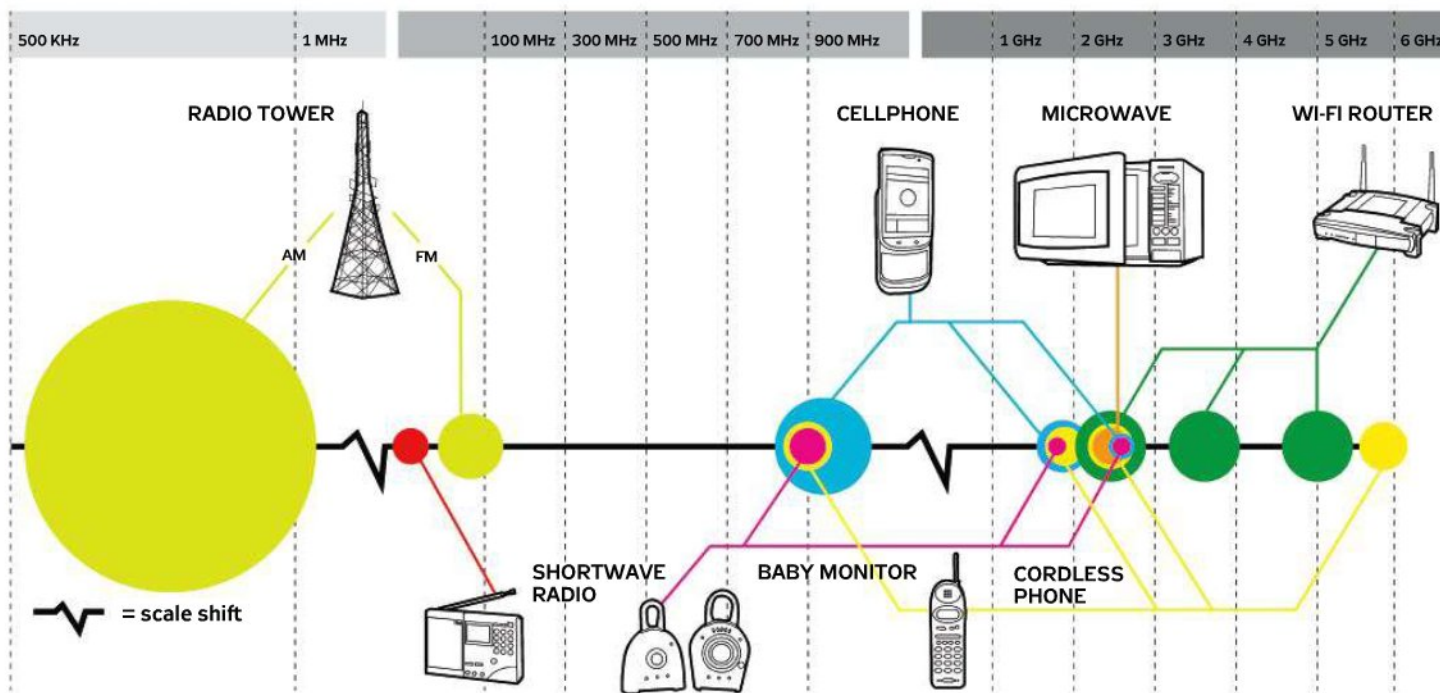
"hearing" another. The 2.4-GHz microwave overpowers the 2.4-GHz router and the laptop gets confused.

For decades, the FCC has tried to prevent this. It issues regulations that cover both a device's "noise"—unintended, useless emissions, like those from a shoddily shielded microwave—and its susceptibility to interference from other gadgets. "The people in the regulatory business produce standards for emissions and standards for immunity, or susceptibility, that *should* match, so that nothing emits more than anything else can tolerate," says Brian Lawrence, executive director of the International Association for Radio, Telecommunications and Electromagnetics (INARTE). "We know, however, that things go wrong." Or to rephrase, things go *bzzt-baba-bzzt-baba-bzzzzzzzt*.

RADIO-FREQUENCY FINDER

WHAT'S MY GADGET'S WAVELENGTH?

Radio-frequency interference occurs when the signal emitted by one device gets unintentionally picked up by another—creating audible noise or a compromised connection. Some interference is due to badly shielded wires or components, but some is just the result of too many gadgets crowded into a limited spectrum.



Unintended Receiver

➔ The explosion of complexity in electronic devices certainly hasn't made things easier. "If somebody, perhaps even someone who's fairly well-versed in the function of the device, opens a laptop computer to fix an RFI problem and doesn't put it back together properly, or forgets a gasket or even one screw out of seven, it could degrade shielding," says Shirish Shah, president of Compliant Electronics, an EMI (electromagnetic interference) testing firm. A laptop contains dozens of small emitters, the radiation and susceptibility of which must be accounted for.

Despite this complexity, Shah says, companies are responding with better devices and better compliance. The only exception? "When offshore companies try to reduce costs or cut corners." Lawrence echoes the sentiment. "We have abdicated manufacturing responsibility to developing nations, where the expertise is not as well-established as it should be."

But a mere explanation is cold comfort to the buzz-afflicted, and a thousand reasons aren't worth a single solution. Unfortunately, life is tough for a DIY RFI warrior. The conventional wisdom about insulating from heat or sound doesn't really apply to RFI shields. (For example, a thinner shield may be more effective than a thicker one, since its ability to attenuate is determined in part by the wavelength of the radiation.) Furthermore, a poorly designed shield could actually retune emissions to another frequency, replacing one type of interference with another. (In the case of dedicated RFI filters for power and phone connectors, as well as for radio and television antenna leads, each unit attenuates certain frequencies but not others.)

Band Management

➔ The enthusiast's best weapon against RFI is the ability to adapt. If an older cordless phone is plagued with interference, it's worth looking into a new handset. Modern wireless phones have moved from overcrowded frequencies, such as 2.4 GHz, shared with Wi-Fi routers and

microwave ovens, to more peaceful pastures, most commonly by way of the Digital Enhanced Cordless Telecommunications (DECT) 6.0 standard. DECT operates at around 1.9 GHz, a frequency range far away from most common, non-communications causes of interference, and uses cleverly controlled, minute frequency changes to avoid what little disturbance may crop up from cellphones and other DECT devices. Likewise, newer Wireless N routers are able to operate in another relatively quiet band of frequencies, near 5 GHz.

That's not to say that buying new gear is the only option. As mentioned earlier, audio equipment can amplify noise from certain cellphones (iPhones are known for this, although other phones can cause problems as well). If your phone is buzzing through your speakers, you may be able to switch the frequencies the phone operates on, from 850 MHz (often labeled as EDGE) to higher, 3G frequencies. Changing this setting, which can be found in most phones' configuration menus, can negatively affect data speeds and signal strength, but it'll almost always kill that annoying buzz. Also, cheap ferrite beads can filter out RFI. These beads can be bought from electronics stores or cut from the weighted cylinders found on many cheap USB cables and then wrapped around the wires running from an audio source to the amplifier or, in rare cases, around the speaker wires themselves.

Placement also counts for a lot. Electromagnetic fields drop off quickly, so keeping a cellphone just 4 or 5 feet from vulnerable speakers or amplifiers will usually dull interference sounds beyond perception. A Wi-Fi-attacking microwave can be thwarted by keeping routers and wireless devices at least 10 to 15 feet away. If a CRT monitor or stereo amplifier gives you persistent trouble, check for less obvious, nearby emitters. Anything with an electric motor, such as an AC unit, can produce some nasty noise, but rarely do these fields reach very far. When it comes to RFI, a little distance can go a long way. **PM**



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HOW FAST IS USB 3.0?

The newest version of the ubiquitous connection technology is backward-compatible and theoretically 10 times faster than USB 2.0. But what does this mean with real data?

The Specs

USB 2.0, the current standard, is designed to operate at a maximum throughput of 480 megabits per second. It also provides power to peripheral devices: typically 5 volts and 0.5 amps (USB ports on some computers can provide up to 1.5 amps). USB 3.0 is spec'd to transfer data at up to 4.8 gigabits per second and provide up to 0.9 amps to active devices.

Test 1: Movie File

Our transfer of a single 1.4 GB movie file from an internal hard-disk drive (HDD) to an external USB 2.0 HDD took 1 min, 7 sec. Transferring it to an external USB 3.0 HDD took only 22 sec. We also tested an external USB 3.0 solid-state drive (SSD), which did the transfer in 18.1 sec. Mysteriously, when transferring the file in the other direction, USB 2.0 was fastest at only 9.6 sec, compared with 19.9 and 14.3 sec for USB 3.0 HDD and SSD, respectively.

Test 2: Photo Folder

Next, we tried a 3.3 GB folder filled with 291 digital photos. The faster internal workings of the USB 3.0 SSD really shone here, taking only 1 min, 28 sec to move the folder. The USB 3.0 HDD took 1 min, 58 sec, while the USB 2.0 drive was far pokier at 3 min, 10 sec.

Digital Clinic

by Seth Porges



Q+A

for different groups of friends.

But there is a problem with Facebook's Friend Lists feature: Nobody uses it. According to CEO Mark Zuckerberg, just 5 percent of Facebook users had made a list as of October 2010. Now,

this isn't a company that lets its technology stagnate—witness Facebook's recent push into e-mail with the Messages service, introduced as an apparent competitor with Gmail. After the failure of Lists, Facebook decided to start over and created Facebook Groups, a new friend-dividing feature that uses an opt-out strategy as a way of reaching widespread adoption.

With the new Facebook Groups, you can create a list of pals (such as "Work," "Family" or "Roller Derby") and add whichever friends you want. Members can then send mass e-mails to the entire group ("Party at my house!") or post to a shared wall space.

Facebook executives probably feel that allowing users to force their friends into Groups is the only way to get a critical mass to use the feature (remember that 5 percent figure for Friend Lists). The company used a similar strategy to turn its Photos feature into one of the largest repositories of drunken party pictures the

world has ever known—although a minority of users actually upload photos to Facebook, anybody can "tag" his or her friends in these pictures, and a whopping 95 percent of users have been tagged.

But while Facebook Groups may prove indispensable to a lot of users, this strategy also raises a number of worries. Users can easily find themselves a member of a handful of groups they never wanted to belong to, which creates the opportunity for mischief. For example, TechCrunch editor Michael Arrington recently added Zuckerberg



Grouping Friends

I keep getting Facebook notifications informing me that I've been added to a "group." What's the deal?

A If you have hundreds or even thousands of Facebook friends, it's easy to cross over into too-much-information territory. After all, who wants their parents or boss to see everything they put up for their friends? That's why Facebook has long allowed users to create Friend Lists, which let people manage their privacy settings

(with whom he is Facebook friends) to a fictitious pedophilia-related group as a way of proving the point.

Such matters aside, Facebook Groups presents a much more immediate problem for most users. By default, all members of a Facebook group get e-mail notifications when just about anything group-related happens—including incidental messages and wall posts. And such updates can start to seem like spam.

Fortunately, cutting down on unwanted notifications is simple. First, click on Account on the top right of the Facebook home page, then select Account Settings in the drop-down menu. From there, click the Notifications tab and scroll down to Groups. This will bring up a page that allows you to curate what sort of Group-related activity results in e-mail alerts. Another level of notifications can be filtered out by opening up the page for an individual group, then clicking the Edit Settings

tech
tip

Looking for an easy way to skip around on YouTube videos? Reach for your keyboard's number keys. Pressing the "1" button while watching a video (as long as it's not in full-screen mode or embedded on an outside page) jumps it to the 10 percent mark, "2" to the 20 percent mark and so on.

button on the top right.

Sharing Netflix

Other members of my household want to use my Netflix account to stream movies on their computers and phones. Is there any reason I can't share my account with them?

Not in the slightest. Sharing a Netflix account with other members of your household places you well within the company's Terms of Service agreement.

In fact, a single account can be spread among up to six devices (including PCs, phones, tablets, game consoles and set-top boxes) and can even play through several of them at the same time (the max number of simultaneously playing devices varies between one and four, depending on your specific plan). To manage which devices can tap into your account, go to netflix.com and click on Your Account & Help, on the top right of the home page. To remove a device from the list, click on the link for Manage Netflix Ready Devices and Computers. To add a new one, click Activate a Netflix Ready Device.

This multidevice arrangement is designed to make life easier for large and gadget-packed households, but there is really nothing technologically preventing subscribers from sharing their passwords with a friend (or five) who does not live under their roof. (Nothing, perhaps, other than a guilty conscience and the shame that comes from friends seeing some of your more embarrassing movie picks pop up in the list of Recently Watched titles.) And while Netflix officially frowns on account sharing ("A Netflix account is for individuals or households, and we expect Netflix users to abide by these terms," Steve Swasey, the company's vice president of corporate communications, told me), it has done nothing to curb the practice. Some observers have even speculated that it is part of a carefully calculated sample strategy. I know several people who were first introduced to the service through friends' accounts and have since gone on to subscribe for themselves. Just be careful: If you do share your Netflix password with somebody—household member or not—be sure it differs from that of any sensitive sites you might use. Unless, that is, you want your movie-watching buddy to also be able to dip into your e-mail or bank account.

Return of the Butt Dial

I thought my iPhone's touchscreen was supposed to be immune to butt dialing. But it still happens sometimes. What gives?

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than detecting your finger's pressure like older resistive touchscreens, it instead responds to the tendency of human skin to disrupt an electrical field that is generated by the touchscreen. Cool stuff. And because this effect depends on the presence of actual skin (a fact that prevents the screens from being used through most gloves), these screens are presumably immune to the dreaded butt dial, an accidentally placed call that occurs when posterior pressure is applied to the buttons of a cellphone parked in somebody's back pocket.

However, several readers have pointed out that, on rare occasions, their iPhone is still prone to making these ghost calls—particularly when the user is sweaty. Without going into too much gruesome detail, the sweat seems to act as a bridge between the skin on one side of the pants and the phone screen on the other, allowing the skin to affect the electrical field through the fabric. The, uh, bottom line: If it's a muggy day or you've been doing some dancing, you might be advised to keep your phone in your jacket pocket.

Kindle Files

What's the easiest way to get PDFs onto my Kindle?

Piece of cake: Just plug your Kindle into your computer using the included USB cord, and the device will pop up as an external drive. Then, when you drag your PDFs into the Documents folder, they'll pop up in your Kindle's list of books. (Just know that, while second-generation and newer Kindles have no trouble reading PDFs, the original model still requires users to convert the files into a Kindle-friendly file such as the .azw format.)

But the Kindle is nothing if not a

wireless device—after all, the one-two punch of wireless 3G connectivity and access to a bookstore were responsible for jump-starting the entire e-reader category three years ago by allowing people to buy books without so much as looking at a computer screen.

Your Kindle has its own e-mail address (set it up at the Manage Your Kindle page at amazon.com). Sending PDFs to this @kindle.com address allows them to be downloaded over the device's 3G connection for 15 cents per megabyte in the U.S., or 99 cents per megabyte overseas. If you have the new

third-generation Kindle (the first with Wi-Fi), sending PDFs to the same address, but with @free.kindle.com instead of @kindle.com, allows you to download them for free from a Wi-Fi hotspot. **PM**

Got a technology problem?

Ask **Seth** about it.

Send your questions to pmdigitalclinic@hearst.com or over Twitter at twitter.com/sethporges. While we cannot answer questions individually, problems of general interest will be discussed in the column.



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Product Update

→ In September's DIY Tech section, we highlighted several hubs that turn standard USB drives into network drives. One reader pointed out that the lomega iConnect (\$99) is not fully compatible with Windows 7. We contacted lomega, which acknowledged that the Retrospect Express backup software that shipped with the device was not fully compatible with Win 7 but says the software has since been updated and should now work.

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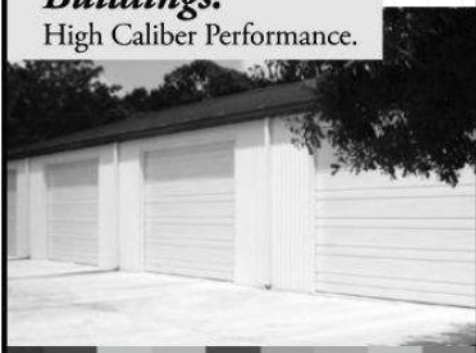
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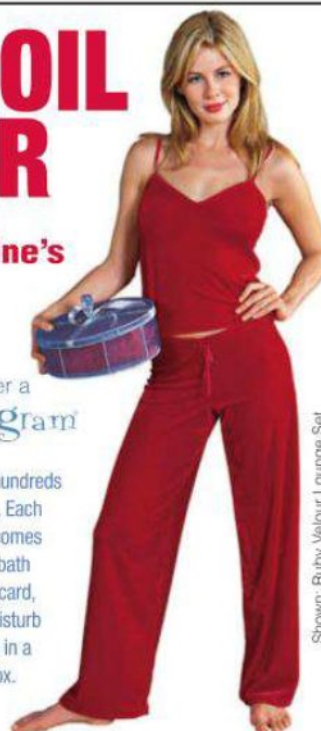
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This Is My Job

× SUSPENDED-ANIMATION SCIENTIST

Name: MARK BUDDÉ
Location: SEATTLE, WASH.
Age: 28
Years on Job: 6

HOW IT WORKS: SUSPENDED ANIMATION

GROW NEMATODES

C. elegans has many of the same life processes as humans—including digestive, muscle and sexual-reproductive systems—and is easy to manipulate. Budde can create many genetic strains to determine which worms best respond to hydrogen sulfide gas; studies have shown that the gas protects organs from cell die-off caused by a lack of oxygenated blood.

EXPOSE THEM TO GAS

After creating mutations in about 100,000 worms, Budde gasses them from a tank equipped with a mass flow controller that measures how much hydrogen sulfide gas is flowing. Exposure activates a genetic pathway regulated by the HIF-1 protein. Within 4 hours, worms go into a suspended state as the gas blocks oxygen usage in their bodies.

OBSERVE WORMS

As he exposes the nematodes to the gas, Budde observes them with a dissecting microscope to identify the ones that respond the quickest.

STUDY SURVIVOR GENETICS

Most worms begin moving again after the gas is shut off. Budde grinds up these survivors and analyzes the proteins using a mass spectrometer, searching for clues as to how an animal can go into a suspended state and reactivate without damage. Scientists could use this information to develop therapies that would be administered to patients in emergencies, giving doctors more time to work.

× Years ago, Mark Budde saw a documentary about a child who survived after being trapped for hours under the ice in a frozen lake. "I thought, how did this kid keep from drowning, and why isn't anyone studying it?" he says. His curiosity led him to study suspended animation: a state where observable life processes, including movement, breathing and heartbeat, appear to have stopped. Since 2005, Budde has analyzed the genetics behind hydrogen sulfide-induced suspended animation in nematodes. The Ph.D. student endures long hours in the lab because the goal—preserving life—is so profound. "If we can understand what genetic pathways are involved," he says, "we could apply that knowledge everywhere from the emergency room to the battlefield." — AMBER ANGELLE



✓Yes



✓Yes



✓Yes



✓Yes



✓Yes



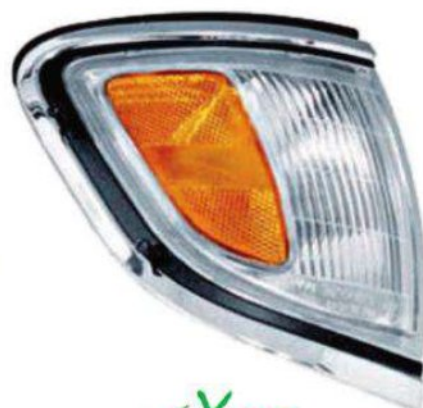
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